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ENVIRONMENT

Subject:

Response to USEPA Comments on March 2017 Site-Related Groundwater Ecological Assessment Report – Ringwood Mines/Landfill Site, Ringwood, New Jersey

Date:
June 2, 2017

Contact:
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Our ref:
NJ000604.2014

Dear Mr. Gowers:

Arcadis U.S., Inc. (Arcadis), on behalf of the Ford Motor Company (Ford), is providing the enclosed responses to the United States Environmental Protection Agency (USEPA) comment provided electronically on May 9, 2017 pertaining to the March 2017 Site-Related Groundwater Ecological Assessment Report (Site-Related EA) for the Ringwood Mines/Landfill Site in Ringwood, New Jersey. USEPA had previously provided comments on the November 2016 draft Site-Related EA and Ford revised and submitted the document on March 10, 2017. USEPA requested additional information related to the response to Comment number 4 as noted below.

<u>Comment 4: Section 6.2 Sediment Pathway, page 6-2</u>: Using the refined TRVs for lead and copper for the avian receptors, the Tree Swallow still has a HQ greater than "1" based upon the refined NOAEL TRV for lead as shown in Table 8. Although Table 8 Hazard Quotients Based On Sediment includes the revised HQs, the table needs to include the revised avian NOAEL and LOAEL TRVs for lead and copper or this information needs to be provided in Table 5 Hazard Quotients for Tree Swallow Based on Estimated Tissue Concentrations in Food and Table 7 Hazard Quotients for Great Blue Heron Based on Estimated Tissue Concentrations in Food, in order that all calculations be transparent.

Response: The consideration of the refined TRVs only occurs in the final steps of the evaluation, therefore, including information regarding their derivation might be confusing in Tables 5 and 7, which summarize an earlier part of the assessment. Therefore, the text on page 6-2 has been revised to more clearly *explain how the refined TRVs for lead and copper were calculated. In addition, tables have been added (Appendix F) which detail the data included in the calculations, along with the relevant references. Table 8 has been revised to reference this information as the source of the refined TRVs.*

Please let me know if you have any questions or comments on the responses provided herein or the Revised Site-Related Groundwater Ecological Assessment Report. You can reach me at 201.398.4375.

Sincerely,

Arcadis U.S., Inc.

Michael Kleczkowski, P.E.
Principal Engineer/Certified Project Manager

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Enclosures:

1.Revised Site-Related Groundwater Ecological Assessment Report

Ford Motor Company

SITE-RELATED GROUNDWATER ECOLOGICAL ASSESSMENT

Ringwood Mines/Landfill Site,
Ringwood, New Jersey

June 2017

SITE-RELATED GROUNDWATER ECOLOGICAL ASSESSMENT

Ringwood Mines/Landfill Site, Ringwood, New Jersey

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ACRONYMS AND ABBREVIATIONS

AC	Area of Concern
ADD	average daily dose
Arcadis	Arcadis U.S., Inc.
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
COCs	constituents of concern
COPEC	constituents of potential ecological concern
CMP	Cannon Mine Pit
CSM	conceptual site model
EA	Ecological Assessment
EBSL	ecologically-based screening level
EcoSSLs	Ecological Soil Screening Level
EPC	exposure point concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
Ford	Ford Motor Company
HQ	hazard quotient
LEL	lowest effects level
LOAEL	lowest observed adverse effects level
mg/kg	milligrams per kilogram
NJDEP	New Jersey Department of Environmental Protection
NOAEL	no observed adverse effects level
NPL	National Priority List
OCDA	O'Connor Disposal Area
O'Connor	O'Connor Trucking and Haulage Company
PCBs	polychlorinated biphenyls
PDB	passive diffusion bag
PMP	Peters Mine Pit
RI	remedial investigation
RIR	remedial investigation report
RL	reporting limit
SEL	severe effects level
SLERA	Screening Level Ecological Risk Assessment

SR	sludge removal
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TOC	total organic carbon
TRV	toxicity reference value
UCL	upper confidence level
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WCC	Woodward-Clyde Consultants
µg/L	micrograms per liter

EXECUTIVE SUMMARY

On behalf of Ford Motor Company, Arcadis U.S., Inc. has prepared this Site-Related Groundwater Ecological Assessment (EA). This EA was prepared in accordance with the Ringwood Mines/Landfill Site Administrative Settlement Agreement and Order on Consent (United States Environmental Protection Agency [USEPA] Region 2, Docket No. 02-2010-2020) dated May 2010 (USEPA 2010a).

The purpose of this EA for Site-related groundwater is to evaluate the potential for risk to ecological receptors associated with constituents in groundwater related to historic landfill activities at the Site. This EA has been conducted in accordance with the USEPA's Ecological Risk Assessment Guidance for Superfund (ERAGS): Process for Designing and Conducting Ecological Risk Assessments (USEPA 1997) and Guidelines for Ecological Risk Assessment (USEPA 1998).

The scope of this EA is focused on evaluation of potential exposure to groundwater; however, because ecological receptors are not directly exposed to groundwater, a complete pathway can only exist if constituents in groundwater are transported to and discharged to surface water. Constituents in groundwater are only a concern if they discharge to surface water at concentrations that are also of concern. The constituents of potential ecological concern (COPECs) were therefore defined as those constituents that were reported in both groundwater and surface water at concentrations above ecologically-based screening levels (EBSLs). Sediment data collected at the Site are also included in this EA. Exposure pathways associated with sediment were also addressed in the approved land-based risk assessments submitted to USEPA between 2010 and 2013 and were found to be associated with minimal risk (Arcadis 2012a, b; 2013a, b, c, d). In addition, a sediment pore water investigation was conducted in 2014 that confirmed that benzene was not discharging to the surface water of Park Brook. The results of the pore water study are summarized in the EA.

COPEC values for surface water utilized in the evaluation were based on maximum concentrations reported in any one groundwater or surface water sample collected at the Site. This assessment is highly conservative because receptor populations in surface water are not exposed to only the maximum concentration, but rather to an average of all concentrations that may be present near a receptor. It is also highly conservative because maximum concentrations reported in any groundwater or surface water sample are not representative of a specific groundwater to surface water discharge pathway, the numerical values are simply compared to their respective EBSL regardless of the well or surface water sample location. Note that final risk estimates considered 95th percentile upper confidence interval of the mean (95% UCL) concentrations when there was a sufficient number of samples in which the constituent was detected. Those values represent a more ecologically relevant estimate of exposure than the maximum concentrations.

Based on the evaluation of recent data, including surface and groundwater samples collected during an annual Site-wide sampling event in 2015, annual Site-wide groundwater analytical results collected in 2014 and supplemental groundwater 1,4-dioxane analytical results generated in 2016, only five constituents occur at concentrations above their respective EBSL in both groundwater and surface water at the Site, specifically total (unfiltered) aluminum, barium, copper, and manganese as well as dissolved (filtered) manganese. Although 1,4-dioxane has been detected in groundwater and surface water at the Site, no detected concentrations were within three orders of magnitude of the EBSL used to evaluate this constituent. Note that, even using the maximum reported concentration at any well or surface water/seep location, 1,4-dioxane does not occur at concentrations above the EBSL in either groundwater or surface water at the Site and therefore do not meet the definition of a COPEC (i.e., detected in both groundwater *and* surface water above an EBSL). Analytical results from surface water samples collected on March 23, 2016 and analyzed for only 1,4-dioxane via method OSW-8270D were evaluated outside this report. It was determined that these data did not include a higher maximum concentration for 1,4-dioxane than what was already present in the data set from 2015. As such, they were not included in this EA.

With respect to the aforementioned COPEC, the findings of this EA indicate that total barium and total copper were eliminated as risk drivers when upper bound estimates of the maximum concentrations were evaluated. Furthermore, although total barium and total copper were considered COPEC during the initial data screening, all risks associated with their presence in surface water are lower than acceptable levels (hazard quotients < 1) when the more realistic and ecologically relevant 95% UCL is considered indicating no unacceptable risk associated with these total metals.

Total aluminum, total manganese, and dissolved manganese maintained an HQ greater than 1 when the 95% UCL was considered. However, total metals analysis is not the most ecologically relevant analysis since it overestimates the fraction that is bioavailable to an organism. When the dissolved concentration of aluminum is considered, the maximum surface water concentration is below the EBSL indicating risk is unlikely. The dissolved manganese data represent the more relevant concentrations for this metal. The dissolved concentrations of manganese result in a HQ greater than 1 considering the 95th% UCL. However, this metal is naturally occurring and not considered a “key Site constituent” and, historically, has not been a risk driver. The presence of manganese in groundwater is understood at the Site, as well as at upgradient, background well locations. Surface water sample results for manganese from samples collected in the areas of concern are typically an order of magnitude greater than the upstream/ background locations. It should be noted, however, that the upstream/background locations are not near any of the iron mines or iron ore bodies, which are known sources of manganese. Manganese in groundwater is likely reflective of native soil and bedrock, historical mining, and local groundwater geochemical conditions (Arcadis 2015a). As such, any ecological impact, if any, due to the presence of manganese in water are likely associated with these regional conditions and not Site land disposal activities.

Although a number of COPEC were identified in Site sediment using the maximum detected concentrations, when the 95% UCL is considered, most HQs are < 1 with the exception of acetone, antimony, arsenic, manganese, and vanadium with calculated HQs ranging from 1 to 8. In addition, a number of COPECs were detected in a limited number of samples therefore a 95% UCL could not be calculated. These COPEC include 2-butanone, acenaphthylene, benzaldehyde, and antimony which were all detected in only one of 13 samples and beryllium which was only detected in two of 13 sediment samples. Using the maximum detected concentration in sediment for these COPEC, the HQs are still very low, ranging from 1 to 3 (no EBSL is available for benzaldehyde or beryllium). Given that these COPEC were non-detect in the majority of sediment samples, the potential for exposure in sediment is extremely localized and therefore the potential for risk is likewise localized and limited.

Dose modeling was used to estimate potential exposures to upper trophic level receptors to COPECs in sediment focusing on receptors that consume aquatic insects (tree swallow) and fish (mink and great blue heron). All those COPEC identified as bioaccumulative were included in the dose modeling (USEPA

2000). With the exception of copper and lead for tree swallows, all estimated HQs for aquatic-feeding species, considering the ecologically relevant lowest observed adverse effects level (LOAEL), are below 1 indicating no significant risk to ecological receptors due to food chain exposure. Tree swallow LOAEL HQs for copper and lead were 2 and 7, respectively. However, it is important to note that the toxicity reference values (TRVs) applied were very conservative and overestimate actual risks. As discussed in the Baseline Ecological Risk Assessment (BERA) documents for the land based units within the Site, refined TRVs can be defined as the geometric mean of those toxicological results reported for which both a NOAEL and LOAEL value (i.e., bounded values) were reported. If these refined TRVs are applied to the Site-wide sediment data set, all LOAEL HQs would be below 1.

The Site-Related Groundwater RIR (Arcadis 2015a) found benzene and arsenic, in addition to lead, as "key Site constituents" in the CSM. That report indicated that arsenic and benzene were reported at low concentrations in groundwater and surface water that were limited in aerial extent. Note, that even using the maximum reported concentration at any well or surface water/seep location, neither benzene nor arsenic occur at concentrations above their respective EBSLs in groundwater or surface water at the Site. Therefore, neither benzene nor arsenic meet the definition of a COPEC (i.e., detected in both groundwater *and* surface water above an EBSL). Although benzene and arsenic have been reported in groundwater at the Site, the findings of this EA confirm the findings of the previous Screening Level Ecological Risk Assessment (SLERA) and EA evaluations that benzene and arsenic in groundwater and surface water are not of ecological concern. This is also consistent with the findings of the 2015 Site-Related Groundwater RI, which concluded no complete groundwater to surface water discharge pathway for these constituents and therefore no potential for risk to any ecological receptor on or downgradient of the Site due to the presence of arsenic or benzene.

The pore water analytical results confirmed the conclusions made based on the preponderance of groundwater and surface water data generated during the RI that benzene in groundwater is not discharging to the surface water of Park Brook adjacent to or downgradient of the PMP Area. These findings are also consistent with the fact that benzene is not reported at levels above its EBSL in groundwater or surface water and therefore not of ecological concern.

Based on the results of this conservative assessment, the potential for ecological risks associated with the five COPEC (total aluminum, total barium, total copper, total manganese, and dissolved manganese) reported in both groundwater and surface water or additional COPEC selected in sediment is extremely low and no further evaluation is warranted. Risks to lower trophic level organisms (as shown through direct screening) and upper trophic level receptors (via dose modeling) are minimal. This conclusion is consistent with the evaluation of groundwater and surface water in relation to each land-based Area of Concern (AC) as documented in the approved SLERAs and BERAs for the Cannon Mine Pit Area, Peters Mine Pit Area, and O'Connor Disposal Area. The conclusion of these investigations was that potential ecological risks associated with the land-based ACs, including soil, sediment, surface water, and groundwater was acceptable and that no further action was required.

1 INTRODUCTION

On behalf of Ford Motor Company (Ford), Arcadis U.S., Inc. (Arcadis) has prepared this Ecological Assessment (EA) for the Site-related Groundwater Area of Concern (AC). As requested by the United States Environmental Protection Agency (USEPA)[1], this EA evaluates potential ecological risks associated with groundwater across the entire Ringwood Mines/Landfill Site located in Ringwood, New Jersey (Site). The Site location is shown on Figure 1.

The scope of this EA is focused on evaluation of potential exposures to groundwater; however, because ecological receptors are not directly exposed to groundwater, other media are also included in the evaluation. A complete pathway can only exist if constituents in groundwater are transported to other media including surface water, sediment, or pore water. Potential exposure via the sediment pathway is also evaluated in this EA; although, previous analysis during each land-based AC risk assessment found the sediment pathway to be associated with minimal risk (Arcadis 2013b, c, d). A pore water evaluation was conducted in September 2014 in the Peter's Mine Pit (PMP) Area (Arcadis 2015a). The results of the pore water investigation confirmed that benzene in groundwater is not discharging to the surface water of Park Brook at locations adjacent to and downgradient of the PMP Area. The pore water investigation was presented in the Site-Related Groundwater Remedial Investigation Report (GW RIR; Arcadis 2015a), and is summarized in this EA for completeness.

For the purpose of this EA, three potential exposure pathways for constituents of potential ecological concern (COPEC) were evaluated: (1) groundwater discharge to surface water, (2) sediment, and (3) pore water. Each pathway has been evaluated separately. Because constituents in groundwater are only a concern if they discharge to surface water at concentrations that are also of concern, groundwater related COPEC were identified as those constituents reported in both groundwater and surface water at concentrations above their respective ecologically-based screening level (EBSL). Sediment samples were compared to EBSLs to aid in the selection of COPEC.

COPEC utilized in the evaluation of groundwater were selected based on maximum concentrations reported in any one groundwater or surface water sample collected in recent samples at the Site. Recent data include surface and groundwater collected as an annual Site-Wide sampling event in 2015 and groundwater data collected between 2014 and 2016. This approach to selecting COPEC is conservative in that maximum concentrations reported in any groundwater or surface water sample are not representative of a specific groundwater to surface water discharge pathway. Instead, the numerical values of the constituents are simply compared to their EBSL regardless of the well or surface water sample location. Similarly, sediment COPEC were selected using a comparison of maximum concentrations to EBSLs. Note that final risk estimates for COPEC in each medium considered the more realistic and ecologically relevant 95% upper confidence level (UCL).

This EA was prepared in accordance with the Ringwood Mines/Landfill Site Administrative Settlement Agreement and Order on Consent (USEPA Region 2, Docket No. 02-2010-2020) dated May 2010 (USEPA 2010a) and the USEPA *Guidelines for Ecological Risk Assessment* (1998).

[1] During a conference call on January 7, 2013, representatives of the USEPA requested that Ford prepare an EA for the Site- related groundwater AC.

The Site is 0.5 mile wide and approximately 1.5 miles long encompassing approximately 500 acres. In an Administrative Order on Consent finalized in May 2010, USEPA divided the Site into four ACs including the land-based ACs, the Cannon Mine Pit (CMP) Area, the Peters Mine Pit (PMP) Area, and the O'Connor Disposal Area (OCDA). The fourth AC is defined as Site-related Groundwater (USEPA 2010a).

A number of ecological investigations have been undertaken at the Site including both a Screening Level Ecological Risk Assessment (SLERA) and an EA for each of the three land-based ACs, specifically the CMP Area, PMP Area, and OCDA, focusing on ecological exposures to soil, sediment, surface water, and groundwater within each AC. The conclusion of these investigations was that potential ecological risk associated with the land-based ACs, including surface water, groundwater, soil and sediment exposure pathways, was within acceptable USEPA benchmarks and that no further action was required. These documents were submitted to USEPA between 2010 and 2013 and were subsequently approved by the agency.

1.1 Scope of Site-Related Groundwater Evaluation

The purpose of this EA for Site-related Groundwater is to evaluate the potential risk to ecological receptors associated with constituents in groundwater related to historic landfill activities at the Site. As previously explained, since constituents in groundwater are only a concern if they discharge to surface water at concentrations that are also of concern, COPEC for groundwater were identified as those constituents reported in both groundwater and surface water at concentrations greater than their respective EBSL regardless of their location in groundwater and surface water at the Site. As also previously discussed, COPEC values utilized in the evaluation were selected based on maximum concentrations reported in any one groundwater or surface water sample.

This assessment is therefore highly conservative in that maximum concentrations reported in any groundwater or surface water sample are not representative of a specific groundwater to surface water discharge pathway. Instead, the numerical values of the constituents are simply compared to their EBSL regardless of the well or surface water sample location. Sediment COPEC were also selected by comparing maximum concentrations to EBSLs. Note that final risk estimates for water and sediment considered the more realistic and ecologically relevant 95% UCL.

This EA has been conducted in accordance with the USEPA's Ecological Risk Assessment Guidance for Superfund (ERAGS): Process for Designing and Conducting Ecological Risk Assessments (USEPA 1997) and Guidelines for Ecological Risk Assessment (USEPA 1998). Given the conservative nature of the evaluation, there is high confidence in a determination of negligible, or *de minimus,* risk. However, findings of potential risk are not definitive indications of risk and should be evaluated within the context of known uncertainty (USEPA 1997).

1.2 Document Organization

The document is organized as follows:

- Section 2: Provides a description of the Site and Site-related activities and summarizes available data generated during the remedial investigation (RI). Previous ecological investigations are also summarized in this section.

- Section 3: Presents the Problem Formulation, including a description of the ecological habitats, selection of COPEC, and the ecological component of the conceptual site model (CSM) for groundwater.
- Section 4: Presents the Exposure Assessment summarizing the calculation of exposure point concentrations (EPCs) and exposure assumptions for each assessment endpoint identified in Section 3.
- Section 5: Presents the Effects Assessment, which describes the toxicity benchmarks used to evaluate potential effects to ecological receptors.
- Section 6: Presents the Risk Characterization that summarizes and discusses direct contact exposures.
- Section 7: Presents the Uncertainty Assessment.
- Section 8: Presents the overall Summary and Conclusions.
- Section 9: Presents the reference documents used to develop this EA.

2 SITE DESCRIPTION AND HISTORY

2.1 Site Description

As shown on Figure 1, the Site is located in the New Jersey Highlands, a mountainous part of New Jersey. It is approximately 500 acres in size, is 0.5 mile wide, and approximately 1.5 miles long. The Site consists of moderately rugged forested areas, open areas of overgrown vegetation, abandoned mine shafts and surface pits, an air shaft, a closed municipal landfill, small surficial depositional areas, automobile carcasses, a municipal recycling center, the Borough of Ringwood Department of Public Works Garage, and residential properties. Ringwood State Park is located at the northern edge of the Site.

The Site is bordered by mountainous ridges to the west (Whaleback Mountain, Mine Hill) and north (Hope Mountain, Unnamed Mountain) and lower hills and ridges to the east and south, and is situated on the western side of a valley defined by the Wanaque River watershed. As shown on Figures 2 and 3, there are four primary streams in different parts of the Site that are tributaries to Ringwood Creek: Mine Brook (western and southern areas), Peters Mine Brook (a drainage swale in the central part of the Site), Park Brook (north-central area), and an unnamed tributary of Ringwood Creek identified as North Brook (northern area). The Ringwood Creek watershed drains to the Wanaque Reservoir, which, as shown on Figure 2, is approximately 2 miles from the PMP Area and approximately 0.75 mile from the southern Site boundary in the vicinity of the CMP Area.

There are paved roads in the residential areas and roads leading to former mining areas. These roads are Peters Mine Road, Cannon Mine Road, Van Dunk Lane, Sheehan Drive, Milligan Drive, Horseshoe Bend Road, and Petzold Avenue. There are also many former mine roads and trails. Some are dirt roads and others are covered with asphalt, gravel, or mine tailings. A few of the trails and former mine roads are in various states of natural reclamation.

The Borough of Ringwood Department of Public Works Garage is located near the intersection of Peters Mine Road and Margaret King Avenue, and the Borough Recycling Center is located approximately 0.5 mile north on Peters Mine Road. There is a Public Service Electric and Gas Company power substation on the eastern side of Peters Mine Road, approximately 400 yards north of the Margaret King Avenue intersection.

2.2 Site History

The Ringwood Mines/Landfill Site is a historical iron ore mining site that operated from the 1700s until the 1950s. In 1942, the U.S. Government purchased the Upper Ringwood Area (approximately 870 acres) and invested heavily in the mines to prepare them for potential use in World War II.

Activities conducted by the U.S. Government's lessee, the Alan Wood Steel Company, from 1942 until 1945 included the reconstruction of a number of mine-related structures; refurbishment of the mines' water supply system; dewatering of the mines; excavation and on-site disposal of more than 100,000 cubic yards of waste rock and mine tailings (pulverized and small pieces of mined rock and mineral materials discarded after separation from iron ore during the mining process); reopening, enlarging, reconditioning, and extending of the original mine levels; production and processing of some iron ore; and related activities. The U.S. Government sold the mines in 1947 to a private party, but the property reverted to the U.S. Government one year later after the private party filed for bankruptcy. As a result of this long history of mining operations, large volumes of mine tailings were disposed of on-site and then re-worked or scattered across the Site.

In 1958, the U.S. Government sold the property to Pittsburgh Pacific Company, and in 1965 Pittsburgh Pacific Company sold the property to the Ringwood Realty Corporation, a former subsidiary of Ford. In 1967, Ringwood Realty contracted O'Connor Trucking and Haulage Company (O'Connor) to dispose of paper, cardboard, wood, metal, plastic scrap, general trash, paint waste, scrap drums, car parts, and other non-liquid plant wastes from Ford's former Mahwah assembly plant. The O'Connor agreement ran from 1967 until 1971, and required O'Connor to properly dispose of Ford wastes at three locations on the Ringwood Site: the PMP Area, the CMP Area, and the OCDA.

In November 1970, Ringwood Realty donated 290 acres of the Site to the Ringwood Solid Waste Management Authority. By November 1971, Ringwood Realty had sold all but 145 acres of the Site, and by December 1973 Ringwood Realty no longer owned any portion of the Site. Disposition of various solid wastes by others occurred before, during, and after the 4-year period during which Ford-related wastes were disposed of at the Site.

Today, this former mining Site has numerous former mine pits, prospect pits, underground mine workings, and mine waste disposal areas. The material present in the ACs (PMP Area, CMP Area, and OCDA) consists of fill cover soil, mine tailings (PMP Area and OCDA only), construction and demolition debris, general manufacturing wastes, general municipal-type wastes, dried paint pieces (PMP Area and OCDA only), drum remnants, and miscellaneous fill.

2.2.1 Potential Sources of Constituents

Based on the history of disposal operations by several entities at the Site, the potential source of the constituents reported in groundwater or sediment can be related to some or all of the historical Site operations, including:

- Mining operations
- Post-mining automobile disposal and structure fires
- Solid waste disposal
- Ford Mahwah facility waste disposal

Mining Operations

As a result of mining operations from the 1700s through the 1950s, mine tailings were disposed over a broad area of the Site. These mine tailings later became commingled in some places with dried paint pieces, Ford solid waste, and municipal refuse, depending upon the location at the Site. Arsenic and lead are present in these mine tailings as well as native soil and host rock; however, lead concentrations are less than its 400 milligrams per kilogram New Jersey Soil Residential Direct Contact Remediation Standard in native soil, rock, and mine tailings (Arcadis 2008a, 2008b). In addition to the introduction of mine tailings at the Site, the mining operations commonly used petrochemicals and fuels to support the mining activities. Evidence of this was uncovered in 2006, when four underground storage tanks (USTs) were discovered (and subsequently removed and disposed of by Ford) during a soil removal action along the north side of PMP.

Subsequent research revealed that these USTs were likely installed in the mid to late 1940s, when the U.S. Government was renovating Peters Mine. A historical Ringwood Realty map shows that they were located adjacent to a small shed-like structure identified on the legend as an “Oil and Grease Shed”. Aerial photographs from 1951 also reveal staining on the ground close to the USTs. Based on water samples collected from inside the tanks analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons, polychlorinated biphenyls, and metals, it appears that the USTs were used to store diesel fuel. Use of other oils and grease products, and the residuals associated with the materials and machinery left behind when the mine was abandoned, also present potential sources of benzene and lead to the environment.

Mining operations were also supported by an on-site power plant that was located on the southwest side of the pit. It is unclear at this time whether the plant was supported by coal, fuel oil, or both.

At the end of the time period when mine operations ceased (in the 1950s), a large fire burned the PMP mill building and some of the support buildings connected by conveyor. Today, some of the charred remains and burnt wood can be found north of the former mill building. Burnt wood has also been found in test trenches installed in the OCDA.

Post-mining Automobile Disposal and Structure Fires

There is documented evidence that junked cars were placed in the mine pits and other areas of the Site. Historical junk car disposal was documented by the New Jersey Mine Safety Bureau in 1964. Additionally, in a 1965 article in the Patterson Morning Call, Frank Lynford, vice-president of Ringwood Realty, estimated the number of abandoned cars to be more than 10,000 (Yesenosky 1965). Many of these were reportedly removed from the Site later in the 1960s.

A major fire at the Peters Mine occurred in July 1964, burning buildings and some of the mine pit structure (Herald News, July 6, 1964). Historical newspaper articles also document numerous fires in the Cannon Mine Pit during the period of solid waste disposal (Suburban Sunday Trend, March 1, 1970).

Solid Waste Disposal

As previously described, solid waste was disposed of at the Site before, during, and after the 4-year period during which Ford-related wastes were disposed of at the Site. The Site has also been subject to widespread dumping. These waste materials include abandoned automobiles, white goods, tires, household trash, and general debris.

Mahwah Facility Waste Disposal

Ford contracted O’Connor to dispose of paint waste and other non-liquid plant wastes from Ford’s former Mahwah assembly plant at the three ACs from 1967 until 1971. There is also evidence that waste was disposed of in other areas readily accessible by dump trucks. Further, some of the waste, including dried paint pieces, was likely relocated by construction crews and others when fill material was transferred to other locations on the Site. The dried paint pieces found in areas outside the ACs—referred to as sludge removal, or SR, areas —have been removed and properly disposed off-site. Paint waste at the Site has been found to contain petroleum-related VOCs and SVOCs, along with antimony, arsenic, barium, chromium, and lead.

Source removal activities to address Ford-related disposal at the Site has resulted in the removal of a combined total of approximately 50,400 tons of surficial paint waste, soil, and other waste materials. Ford has and will continue to remove additional dried paint pieces if any are discovered at the Site.

Disposal activities, other than Ford's paint waste disposal, may have also contributed to environmental impacts at the Site. The focus of the groundwater RI was on the characterization of groundwater and surface water as it relates to paint waste disposed by Ford; however, the contribution of background conditions due to mine tailings and other disposal operations are also considered, as appropriate.

2.3 Geology/Hydrogeology

2.3.1 Geology

The Site is located in the southeastern extension of the New England Highlands Physiographic Province. The portion located in New Jersey is known as the New Jersey Highlands. In areas of well-foliated gneiss, the topography of the New Jersey Highlands consists of northeast-southwest trending parallel ridges. The more common, less foliated gneiss forms rounded or broad-topped topographic highs. Granite gneiss and pegmatite form sharp ridges separated by narrow troughs underlain by less resistant gneiss. Major cross faults are visible as trench-like features that interrupt drainage. Those faults generally strike approximately east-west across the predominant northeast strike of the major ridges and valleys (Hotz 1953).

Structural features of the New Jersey Highlands, which are regionally related either spatially or tectonically, include folds, faults, lineation trends, and jointing. The New Jersey Highlands has experienced a complex history of folding and faulting, the result of both Precambrian and post-Precambrian tectonism. The formation of the New Jersey Highlands and the associated faulting and folding, which produced structural complexities in the region, occurred during the closing periods of the Paleozoic Era concurrent with the formation of the Appalachian Mountains (Woodward-Clyde Consultants [WCC] 1988).

The New Jersey Highlands in Passaic County are drained by the Pequannock, Wanaque, and Ramapo Rivers, which ultimately join to form the Pompton River, a tributary of the Passaic River. The drainage pattern north of the terminal moraine in the New Jersey Highlands is classified as deranged, and is marked by many poorly drained areas of lakes and swamps. Greenwood Lake and Lake Hopatcong are large lakes formed by the blocking of pre-glacial drainage courses. South of the terminal moraine, stream drainage generally follows structural valleys toward the southwest (WCC 1988).

Unconsolidated soil and sediment deposits are primarily confined to the stream valleys and corridors. Based on the findings of the RI, the unconsolidated deposits are thickest in the eastern and southern parts of the Site. The overburden ranges from approximately 25 to 50 feet thick. The overburden consists of the Rahway Till dating from the Pleistocene age and is reddish-brown, light reddish-brown, reddish-yellow silty sand to sandy silt containing some to many sub-round and sub-angular pebbles and few sub-rounded boulders. The matrix is compact, non-plastic to slightly plastic with coarse sub-horizontal fissile structures, and the clasts are composed of red and gray sandstone and siltstone, gray gneiss, and white to gray quartz and quartzite gravel. Boulders are mainly gneiss, and a few are quartzite or gray and red sandstone (Stanford 2002).

Bedrock is encountered at approximately 25 to 50 feet below ground surface (bgs). Bedrock consists of Mesoproterozoic age metasedimentary rocks of the Vernon Supersuite and gneisses of the Losee Metamorphic Suite, approximately 1.3 billion years old. The rock primarily consists of calc-alkaline and plagioclase gneisses. There are occurrences of pegmatite, pyroxene-amphibolites, biotite-quartz feldspar gneiss, and magnetite iron ore. The structural nature of bedrock at the Site is complex. The gneisses are moderately to well foliated, have mineral lineation, and display evidence of three distinct folding events. Joints are prevalent in the bedrock and are characteristically moderate to well developed, planar, typically unmineralized, and moderately to steeply dipping with spacing from 1 foot to several tens of feet (Volkert 2008).

The iron ore found in Ringwood is thought to be hydrothermal deposits consisting primarily of magnetite that replaced pyroxene amphibolites and skarn rocks. The iron ore formed around the same time as emplacement of granite and pegmatite, approximately 950 million years ago.

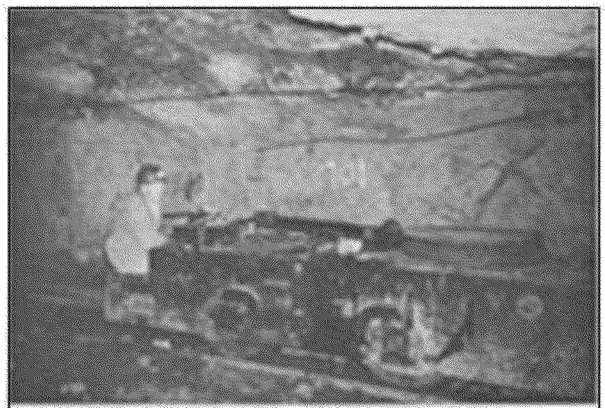
2.3.2 Hydrogeology

Groundwater at the Site occurs in both overburden and bedrock, but only in overburden is it sufficiently thick to be continually saturated, usually a thickness observed to be greater than 8 feet. Where saturated, the overburden defines an upper aquifer and fractured bedrock- a lower, or deeper, aquifer. The transition from the overburden aquifer, where it is present, to the bedrock aquifer is marked by a weathered bedrock zone of variable thickness (ranging from 0 feet to approximately 20 feet). Data generated during the RI indicate that there is limited hydraulic communication between the overburden and bedrock aquifers beyond the immediate vicinity of the underground mine workings because of the poor vertical permeability and transmissivity of the crystalline bedrock.

Groundwater occurs in the overburden under unconfined, water table conditions in the PMP Area and the OCDA. Although saturated overburden has not been encountered in the CMP Area because of insufficient overburden thickness, groundwater occurs in the bedrock aquifer beneath the entire Site, including within the CMP Area. The overburden aquifer is monitored in two zones, the upper water table and the lower, or deeper, overburden. The bedrock aquifer is monitored in multiple zones ranging from tens of feet in depth to approximately 500 feet bgs. Based on monitoring well yield during the more than 30 years of groundwater sampling at the Site, the hydraulic conductivity of the overburden aquifer is low to moderate and is low to very low in the bedrock aquifer.

In the PMP and CMP Areas, the abandoned underground mine workings have filled with groundwater and, therefore, represent significant storage of groundwater with the volumes of stored water estimated at 213,000,000 gallons and 49,000,000 gallons, respectively (Getz 1965). Based on the very low historical mine dewatering rates (less than 54 and 33 gallons per minute, for the PMP and CMP Areas, respectively) and low to very low monitoring well yields during monitoring well purging and sampling, the significant storage of groundwater within the abandoned mine workings does not appear to contribute to or increase the overall local hydraulic transmissivity, or groundwater movement, within the massive crystalline bedrock. Moreover, this large volume of groundwater storage and lack of yield from the area-specific monitoring wells indicates that fractures within the crystalline bedrock have very limited transmissivity and/or connectivity.

The historical image to the right, of former mine workings, shows the massiveness of the rock and mine tunnels and illustrates that the tunnels are dry and the bedrock is not visibly fractured.



Historical photo of mine workings.

The depth to groundwater in the overburden fluctuates seasonally and is typically deeper during dryer summer months with some wells being dry, or nearly dry, during drought conditions. The results of the RI indicate that the groundwater discharge volume to streams and brooks likely vary seasonally across the Site.

The direction of groundwater flow in both the overburden and bedrock aquifers is generally to the southeast. Groundwater ultimately discharges to streams, creating base flow in the perennial streams. As shown on Figure 2, surface water within the streams ultimately discharges into the Wanaque Reservoir, located approximately 1 mile from the confluence of Park Brook, North Brook, Mine Brook, and Ringwood Creek (WCC 1988).

Although groundwater at the Site is classified as Class IIA, a potential potable water source by the New Jersey Department of Environmental Protection, groundwater at the Site is *not* used for potable or domestic purposes. Further, as discussed in the GW RIR (Arcadis 2015a) and Draft Baseline Human Health Risk Assessment (Arcadis 2015b), it is unlikely that it would be in the future based on naturally occurring and elevated iron and manganese concentrations and the insufficient yield of the aquifer. In fact, drinking water for the nearby residents is provided primarily by four Borough of Ringwood water production wells located approximately two miles southeast of the Site in a completely separate subwatershed.

2.4 Summary of Groundwater and Surface Water Sampling Investigations

Groundwater investigations of the Site have been ongoing since the Site was included on the National Priorities List (NPL) in 1983 and the first detection of paint waste and waste materials at the Site in 1984 (Arcadis 2015a). Between 1984 and 1990, Ford completed a series of investigation and cleanup activities at the Site under the oversight of the USEPA to address paint and other wastes at the Site. The work also included groundwater monitoring the results of which showed that concentrations of Site-related constituents – specifically VOCs, SVOCs, and metals – were low and not migrating off the Site. In 1994, USEPA removed the Site from the NPL.

This action was supported by the results of a five-year environmental groundwater monitoring program – carried out between 1990 and 1995 – which showed that Site-related constituents in groundwater were only detected sporadically, and when detected, were at generally low concentrations. Further, no constituents were found in any off-site drinking water samples, and follow-up sampling carried out at the request of USEPA in 1998, 1999, and 2000 showed that with the exception of one groundwater monitoring well (OB-14A) lead and arsenic were below relevant health-based standards in all groundwater and surface water samples. In 2000, USEPA also confirmed that the North Jersey Water

Supply District had not reported any concerns regarding the quality of the Wanaque Reservoir, a downstream public drinking water source.

In late 2004, additional paint waste deposits were discovered at the Site, prompting Ford to complete additional removal activities. In September 2006, USEPA added the Site back onto to the NPL. Between 2004 and 2014, Ford and its contractors excavated and disposed of approximately 50,400 tons of combined paint waste, soil, and other waste materials from across the Site (Arcadis 2015a).

Since 2004, Ford has carried out additional groundwater investigations at the Site to further characterize the quality of groundwater at the Site, enhance the understanding of groundwater and surface water movement in different areas of the Site, and assess actual or potential risks to the environment.

2.4.1 Groundwater Conceptual Site Model and Remedial Investigation Report Conclusions

As detailed in the GW RIR (Arcadis 2015a), surface water and groundwater investigations completed between 2004 and 2014 were used to characterize the residual conditions and supplement historical data to develop a Site-wide CSM that provides the framework for describing the nature, extent, fate, and transport of key constituents, including benzene, lead, and arsenic. As previously stated, the scope of this EA is focused on evaluation of potential exposure to groundwater; however, because ecological receptors are not directly exposed to groundwater, transport to surface water has been evaluated. For purposes of this EA, only those constituents that were reported in both groundwater and surface water at concentrations above their respective EBSL were identified as COPEC. See Table 1 for a comparison of the maximum reported concentration of the constituents of concern in groundwater and surface water at the Site in comparison to their EBSL.

As also previously discussed, COPEC values utilized in the evaluation were selected based on maximum concentrations reported in any one groundwater or surface water sample collected at the Site. This assessment is highly conservative in that maximum concentrations reported in any groundwater or surface water sample are not representative of a specific groundwater to surface water discharge pathway. Instead, the numerical values of the constituents are simply compared to their respective EBSL regardless of the well or surface water sample location. Final risk estimates considered more ecologically relevant 95% UCL concentrations.

As a conservative approach, groundwater analytical results from 2014, 2015, and 2016 were included in this evaluation and are provided in tabular form in Appendix A. Surface water analytical results collected in 2015 are provided in Appendix B. Groundwater sample locations are presented on Figure 3. Key conclusions and relevant groundwater and surface water data from the GW RIR are provided below:

- The comprehensive monitoring well network and surface water sampling locations, coupled with the geologic, hydrogeologic, geochemical and environmental data accumulated over the last 30 years of RI activities at the Site, have enabled the effective characterization of the nature and extent of Site-related constituents of concern (COCs) in groundwater and a complete understanding of Site-wide groundwater flow pathways.

Groundwater analytical results indicate that concentrations of COCs are low and limited in extent. Specifically, the results of the RI indicate the following:

- Benzene is localized to and immediately downgradient of the PMP Area. Concentration trend analysis indicates benzene concentrations in groundwater in the PMP Area are generally decreasing, likely due to ongoing natural attenuation, including microbial degradation, which has been shown to occur under existing groundwater conditions at the Site.
- The recent groundwater results are generally consistent with previous analytical results (not withstanding the September 2014 and March 2015 data outliers for benzene from wells SC-01 and RW-6A and SC-01 and RW-6, respectively), but some variability from trends is to be expected.
- In the PMP Area, the natural environmental tracer study conducted as part of the Site-Related Groundwater RI indicates that groundwater discharges to Park Brook, but benzene was not detected in Park Brook surface water collected in 2016; therefore the pathway from groundwater to surface water is considered incomplete. It should be noted that although not used in this EA, the benzene surface water detection from 2015 in Park Brook at sample location SW-PAB-01 was above the surface water quality criteria protective of human health (0.15 micrograms per liter [µg/L]), but below the EBSL value of 114 µg/L and therefore also represented an incomplete pathway.

As shown in Table 1, benzene does not occur above its EBSL in groundwater at the Site and is therefore not a COPEC for purposes of this EA.

- Total arsenic is sporadically reported in groundwater in the PMP Area and OCDA with the reported total concentrations influenced by elevated sample turbidity as well as rare earth element interferences that have resulted in biased-high reported concentrations of total arsenic in historic rounds of sampling as detailed in the GW RIR (Arcadis 2015a).
- Total arsenic is periodically reported in surface water samples at the Site, including upstream of the land based ACs, thus confirming a natural contribution of total arsenic. Arsenic has not been detected at the downstream confluence with the Ringwood Creek.

As shown in Table 1, even with the historically biased-high total arsenic concentrations taken into account, arsenic is not reported in groundwater or surface water at concentrations above its EBSL; therefore, it is not a COPEC for purposes of this EA and is not of environmental or ecological concern with respect to the groundwater discharge to surface water pathway.

- Total lead is sporadically reported in the PMP Area, OCDA, and CMP Area and likely exists as insoluble oxide compounds in the circumneutral groundwater pH conditions at the Site. Total lead concentrations are also biased high due to elevated sample turbidity and are also shown to readily decrease due to natural attenuation processes (including the presence of oxidized groundwater conditions beyond the reducing zone in the immediate vicinity of the PMP and OCDA land ACs). However, lead (total or dissolved) is not reported in surface water above its EBSL (Table 1). Therefore, it is not retained as a COPEC for purposes of this EA.
- Although total aluminum, total barium, total copper, total manganese and dissolved manganese have been reported at concentrations above their respective standards, they are not considered COCs at the Site in terms of the RI. Total aluminum, total barium, total copper, total manganese and dissolved manganese have been identified as COPEC for purposes of this EA based on a numerical comparison of all constituent concentrations in groundwater and surface water to their respective

EBSLs and the fact that these five constituents exceed the EBSL in one or more groundwater and surface water sample collected at the Site.

- RI data collected over the past 30 years confirm that, although groundwater discharges to surface waters at the Site, the COCs benzene and total arsenic are not transported in groundwater or discharging to surface water at the Site at concentrations of ecological concern and no further evaluation is warranted for these COCs.

With respect to total aluminum, total barium, total copper, total manganese and dissolved manganese, the numerical comparison of maximum concentrations reported in groundwater and surface water indicates concentrations above their EBSLs in one or more groundwater and surface water samples collected at the Site. Therefore, these five constituents are identified as COPEC and are further evaluated in this EA. We believe this is a highly conservative approach given that there is no actual completed flow pathway based on the location of the specific wells and surface water samples that the data represent (e.g., the well where the maximum constituent concentration is reported is not immediately adjacent to the surface water where the maximum constituent concentration is reported).

Although 1,4-dioxane has been detected in groundwater and surface water at the Site, no detected concentrations were within three orders of magnitude of the EBSL used to evaluate this constituent. Note that, even using the maximum reported concentration at any well or surface water/seep location, 1,4-dioxane does not occur at concentrations above the EBSL in either groundwater or surface water at the Site and therefore do not meet the definition of a COPEC.

2.5 Summary of Sediment Sampling Investigations

Sediment investigations were conducted in 2005 and 2011 in the four primary streams on Site and the PMP pond. These investigations were conducted to evaluate the nature and quality of the sediments, the extent of any constituent impacts at the Site, and the presence of COPEC in sediment. The sediment sampling included known seep and groundwater discharge locations within the on-site streams and Peters Mine Pit pond (Figure 2). Sediment samples collected from stream and pond samples from within the site boundary where ecological exposure may exist (0 to 6 inches deep) were included in this evaluation.

2.5.1 2005 Stream Sediment Sampling Investigations

In conjunction with the surface water sampling program, a stream sediment sampling program was initiated in 2005 in accordance with the Work Plan for the Stream Sediment/Surface Water Sampling Activities (Arcadis 2005a) and the 2005 Administrative Order on Consent. The sediment sampling locations for each stream are shown on Figure 2. Samples were collected from the upper 6 inches of sediment within the Site boundary, and samples were tested for grain size, Target Analyte List (TAL) metals, Target Compound List (TCL) VOCs, SVOCs, polychlorinated biphenyls (PCBs), and total organic carbon (TOC).

2.5.2 Peters Mine Pit Pond Sediment Sampling

Sediment samples were collected from the PMP Pond in May 2011 in accordance with the USEPA-approved Sediment Sampling Work Plan for the PMP Pond (Arcadis 2011a). This sampling was conducted to evaluate the nature and quality of sediments within the pond and to assess whether COPEC were present within the pond sediments in association with the performance of the SLERA prepared for this area (Arcadis 2012a).

Sediment samples were collected from the base of the pond from the 0- to 6-inch depth interval and analyzed for TCL SVOCs, PCBs, TAL metals, TOC, and grain size. Samples for VOC analysis were collected from the base of the pond from the 6- to 12-inch depth interval using Encore® samplers. For completeness these VOC samples were included in this EA. Sediment sampling locations for the PMP Pond are shown on Figure 2.

2.5.3 Sediment Remedial Investigation Report Conclusions

As detailed in the GW RIR (Arcadis 2015a), samples collected in 2005 and 2011 were used to characterize sediment conditions at the Site and enable risk assessments to be conducted specific for each land based AOC. In this EA, the sediment sample results were considered on a Site wide basis. The 2005 and 2011 sediment analytical results for samples collected inside the Site boundary are provided in tabular form in Appendix C. Sediment sample locations are presented on Figure 2.

Key conclusions and relevant sediment data from the GW RIR are provided below:

- The analytical results generated by the sampling of sediment at the Site indicate that the majority of chemicals were not detected in the sediment samples. Initial sediment screening is presented in Table 2.
- Screening values were not available for a number of constituents including methyl acetate, benzaldehyde and beryllium.
- Of constituents that were detected, many were detected in a limited number of samples.
- The detected VOCs 2-butanone and acetone exceeded a screening value.
- Acenaphthylene, bis(2-ethylhexyl)phthalate and pyrene were the only semi volatile organic compounds exceeding a screening value.
- Several metals exceeded their respective screening values in one or more samples, including aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, vanadium, and zinc.

2.6 Sediment Pore Water Investigation

A sediment pore water investigation was performed in August through September 2014 in accordance with the USEPA-approved April 21, 2014 Proposed Surface Water and Sediment Pore Water Investigation Work Plan (Arcadis 2014). The pore water investigation is summarized in this EA; more details regarding the study are provided in the GW RIR (Arcadis 2015a). The purpose of the study was to further characterize the groundwater flow pathways in the PMP and evaluate the potential discharge of groundwater and flux of VOCs through the sediment pore water beneath the bed of Park Brook. The evaluation included the collection of sediment pore water samples in Park Brook for benzene analysis and water level monitoring with transducers and stream gauges to further refine the CSM for the PMP Area.

A total of seven piezometers were proposed to be installed into the bed of Park Brook. However, based on field conditions encountered during piezometer installation, which included large boulders and cobbles, only one of the proposed locations (PZ-C) could be installed in accordance with the April 2014 Work Plan (Arcadis 2014) as observed by the New Jersey Department of Environmental Protection (NJDEP) and USEPA field staff during the attempted installations. Additional attempts at piezometer installation were made at several locations within Park Brook with refusal continually encountered due to the boulders and cobbles within the poorly sorted glacial deposits in these areas. Following discussions with NJDEP and USEPA, the decision was made to discontinue any further attempts at installing piezometers at the other proposed locations.

Piezometer PZ-C was set to a depth of 4 feet bgs and constructed with 2-inch diameter, Schedule 80 PVC with the bottom 12- inches consisting of 0.020 slotted casing in accordance with the USEPA-approved Work Plan. A 12-inch passive diffusion bag (PDB) pre-filled with laboratory grade deionized water was installed at the base of the piezometer. The PDB remained in place for 28 days prior to removal and was submitted for TCL VOCs analysis by USEPA Method 8260B.

Stainless steel direct point push samplers were also utilized in an attempt to collect sediment pore water samples at each of the locations where piezometer refusal was encountered. Specifically, location PZ-D was the only location where the push point sampler was able to reach the targeted depth of 4 feet bgs and a second pore water sample (designated PZ-D) was collected. Refusal was encountered at the remainder of locations due to subsurface obstructions by cobbles and boulders. Sediment pore water sample PZ-D was also submitted for TCL VOCs analysis by USEPA Method 8260B.

The analytical results of sediment pore water samples collected at PZ-C and PZ-D indicated that VOCs were not detected above laboratory method detection limits in either of the two pore water samples. The samples were collected during extreme base flow conditions (dry stream bed) which is indicative of groundwater underflow conditions. The pore water analytical results confirmed the conclusions made based on groundwater and surface water data generated during the RI that benzene in groundwater is not discharging to the surface water of Park Brook adjacent to or downgradient of the PMP Area. These findings are also consistent with the fact that benzene is not reported at levels above its EBSL in groundwater or surface water and therefore not of ecological concern.

2.7 Summary of Ecological Risk Evaluation Conducted to Date

As previously discussed, both SLERAs and Baseline Ecological Risk Assessments (BERAs) were prepared for the PMP Area, OCDA, and CMP Area. Those investigations evaluated potential ecological exposures associated with all complete exposure pathways. Because ecological receptors do not contact groundwater directly, there is only a complete exposure pathway for groundwater if constituents at concentrations of ecological concern discharge to surface water at concentrations that are of ecological concern. Therefore, the SLERAs and BERAs prepared for the land-based ACs focused primarily on exposures in surface soil, sediment, and surface water. Groundwater was conservatively evaluated in these land-based AC documents by comparing concentrations of detected constituents to EBSL for surface water. Those constituents that exceeded were then evaluated in surface water; if concentrations in surface water were either non-detect or below EBSLs, the groundwater exposure pathway was considered incomplete.

For both the PMP Area and the CMP Area, groundwater was eliminated as a medium of concern with respect to ecological risk because COPEC detected in groundwater were not detected in surface water samples of Park Brook (PMP Area) and Mine Brook (CMP Area) or COPEC concentrations in surface water were less than EBSLs. Based on this assessment, it was concluded that there were no unacceptable risks associated with groundwater or surface water at either of these areas and no further action or evaluation was required.

Although there are no surface water bodies present within the limits of the OCDA, Park Brook is located adjacent to the southeastern boundary of the OCDA and was included in the SLERA for the OCDA as a conservative measure. The analysis conducted was the same as that described for the PMP Area and CMP Area (i.e., groundwater analytical results were conservatively screened against EBSLs and then concentrations of those constituents that exceeded were evaluated in surface water). Based on the SLERA, bis(2-ethylhexyl)phthalate, aluminum, cadmium, cyanide, iron, manganese, and vanadium were identified for further evaluation. However, refinements conducted for the BERA demonstrated that the potential risks identified in the SLERA were the result of conservative assumptions and the BERA concluded that potential risks to ecological receptors within the OCDA associated with exposure to groundwater and surface water are very low and do not warrant further evaluation.

3 PROBLEM FORMULATION

The first step in an ecological risk assessment is the problem formulation, which describes the Site setting and details the development of the ecological CSM (USEPA 1998). The following sections discuss the ecological setting and details utilized in developing the ecological component of the ecological CSM for this EA.

3.1 Ecological Setting and Habitat Characterization

The 500-acre Site includes forested areas, abandoned mine shafts, landfills, industrial refuse disposal areas, residential lots, and a portion of Ringwood State Park as depicted in Figure 2, which was developed from the United States Geological Survey 7.5-minute quadrangles for Greenwood Lake, New York/New Jersey, and Wanaque, New Jersey. The Site is located along the northern side of Margaret King Avenue about one-half mile west of Sloatsburg Road in the Borough of Ringwood, in the northeastern corner of Passaic County, New Jersey. The Site includes both wetland (along the stream corridors) and upland habitats. Historically, the Site area has been logged, in part to allow for mining operations. Ground surfaces at the Site are characterized by dense leaf litter, downed tree branches, and cobble to boulder-sized rocks. Current vegetation at the Site is primarily what has grown naturally over the past 50 years.

There are four surface waters located at the Site including Mine Brook (western and southern areas), Peters Mine Brook (a drainage swale in the central part of the Site), Park Brook (north-central area), and North Brook (north area). These surface water drainages are tributaries to Ringwood Creek which, in turn, flows into the Wanaque Reservoir as shown on Figure 2. Wetlands vegetation consists of skunk cabbage (*Symplocarpus foetidus*), jewelweed (*Impatiens capensis*), cinnamon fern (*Osmundastrum cinnamomeum*), Christmas fern (*Polystichum acrostichoides*), sensitive fern (*Onoclea sensibilis*), tear-thumb (Polygonum sp.), and fringed loosestrife (*Lysimachia ciliata*). Additional shrub species include sweet pepperbush (*Clethra alnifolia*), winterberry (*Ilex verticillata*), and multiflora rose (*Rosa multiflora*). Much of the shrub vegetation appears to have indications of heavy browsing by deer, especially the fringed loosestrife and jewelweed.

3.2 Conceptual Site Model for Ecological Risk Assessment

The ecological CSM identifies the potential sources of COPEC, routes and mechanisms of transport, receiving media, and complete exposure pathways that will be evaluated.

3.2.1 Potential Ecological Exposure Pathways

As previously described, the scope of this EA is focused on evaluation of ecological exposures to groundwater, through exposure to surface water, pore water and sediment. As described in Section 2.6, a pore water investigation was conducted to further characterize the groundwater flow pathways. However, based on field conditions encountered during piezometer installation, including large boulders and cobbles, it was only feasible to collect pore water from two of the seven proposed locations. All of the analytes evaluated were reported as non-detect. Therefore, the pore water exposure pathway is not considered complete and was not further evaluated. For the purpose of this EA, two complete exposure pathways have been evaluated: the potential for COPEC in groundwater to discharge to (1) surface water and (2) sediment. Therefore, the COPEC selection process for water focused on identifying those constituents present in both groundwater and surface water at concentrations above their respective EBSL.

For sediments, a simple comparison of detected concentrations to EBSL was used to select COPEC.

3.2.2 Selection of COPEC – Groundwater to Surface Water Pathway

As described in Section 3.2.1, the water exposure pathway is based on the assumption that constituents in groundwater are only a concern if they discharge to surface water at concentrations that are also of concern.

The COPEC selection process for water was conducted in a step-wise process. The first step was to evaluate the most recent available groundwater data, collected in April, August and December of 2015 as well as in January of 2016 for newly installed overburden wells OB-31 and OB-32 in support of the RI. As a conservative measure, data from September and October of 2014 was also included in the Site-wide groundwater data set (Appendix A). Specific constituents detected in at least one groundwater sample are listed in Appendix A.

The second step in the process was to evaluate the most recent available surface water data, collected in April, August and December of 2015. Specific constituents detected in at least one surface water sample are listed in Appendix B.

Surface water data collected March 23, 2016 and analyzed for only 1,4-dioxane via method OSW-8270D were evaluated outside this report. It was determined that these data did not include a higher maximum concentration for 1,4-dioxane than what was already present in the data set from 2015. As such, these data were not included in this EA.

Site groundwater concentrations for metals and most other inorganic constituents have remained consistent over time. Historical groundwater sample results are discussed in the GW RIR (Arcadis 2015a).

As a first step towards the selection of COPEC, maximum detected concentrations of constituents in groundwater collected during recent groundwater sampling events in 2014-2016 were compared to surface water EBSLs as there are no EBSLs for groundwater. These groundwater sampling results from 2014-2016 are presented in Appendix A. These recent groundwater data were used for data screening to provide an estimate of current conditions at the Site. Again, the groundwater analytical results were compared to available EBSLs for surface water since there are no EBSLs for groundwater.

The comparison of maximum detected groundwater and surface water concentrations to surface water EBSLs is presented in Table 1. Following comparison of the groundwater concentrations to surface water EBSLs, surface water concentrations were also compared to the surface water EBSLs. Any constituent that was detected greater than the EBSL in both groundwater and surface water was retained as a COPEC in surface water. In addition, constituents without EBSLs were considered qualitatively.

Based on evaluation of the analytical results, only total aluminum, total barium, total copper, total manganese and dissolved manganese were retained as COPEC based on their detection in both groundwater and surface water in one or more samples at a concentration above the surface water EBSL. As previously discussed in Section 2.4.1, all other detected constituents, including benzene and arsenic, were not retained as COPEC based on this criterion.

3.2.3 Selection of COPEC – Sediment Pathway

The COPEC selection process for sediment was also conducted in a step-wise process. The first step was to evaluate sediment data collected in 2005 and 2011 in support of the RI (Appendix C) and identify all detected constituents. Specific constituents detected in at least one sediment sample are listed in Appendix C.

Next, maximum detected concentrations of constituents in sediment were compared to EBSLs (Table 2). Any constituent that was detected greater than the EBSL was retained as a COPEC in sediment. In addition, constituents without EBSLs were considered qualitatively. For the purpose of evaluating risks to upper trophic level receptors, constituents considered bioaccumulative (Table 4-2 of USEPA 2000) were also considered COPEC in the dose model.

Based on evaluation of the analytical results, methyl acetate, benzaldehyde and beryllium were retained as COPEC due to a lack of EBSLs. COPEC that exceeded an available EBSL include 2-butanone, acetone, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene, Total PCBs (defined as the sum of the Aroclors), aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, vanadium, and zinc.

3.2.4 Assessment and Measurement Endpoints

Based on the ecological resources and potentially complete exposure pathways, assessment endpoints were developed to identify the ecological attributes that should be protected. In general, assessment endpoint selection considers the ecosystem, communities, and species relevant to a specific site. Assessment endpoints are defined based on technical considerations, including the following:

- The presence of COPEC and their concentrations
- Ecologically-relevant receptor groups that are potentially sensitive or highly exposed to the COPEC
- Potentially complete exposure pathways

Based on the ecological CSM, the potential on-site habitat areas subject to Site-related COPEC are limited to Mine Brook, Peters Mine Brook, Park Brook, North Brook, and wetland habitat that may be influenced by groundwater discharge. Based on the CSM established for these areas, three assessment endpoints were identified for the Site:

Assessment Endpoint No. 1

Do COPEC concentrations in the aquatic environment pose a potential risk to the sustainability of aquatic plant, invertebrate, and fish communities at the Site?

- Measurement Endpoint 1a: Compare concentrations of COPEC in surface water to surface water quality criteria and calculate hazard quotients (HQs).
- Measurement Endpoint 1b: Compare concentrations of COPEC in sediment to EBSL and calculate HQs.
- Measurement Endpoint 1c: Compare concentrations of COPEC in porewater to surface water quality criteria. As previously discussed, there were no COPEC detected in the two pore water samples, therefore this pathway is not considered complete and no further evaluation of pore water is warranted.

Assessment Endpoint No. 2

Do COPEC concentrations in Site-wide sediment pose a potential risk to the sustainability of insectivorous bird populations at the Site?

- ***Measurement Endpoint 2:*** Compare modeled dietary COPEC exposure to toxicity reference values (TRVs) (calculate HQs) for an insectivorous bird, tree swallow (*Tachycineta bicolor*), using aquatic habitat at the Site.

Assessment Endpoint No. 3

Do COPEC concentrations in Site-wide sediment pose a potential risk to the sustainability of carnivorous/piscivorous bird and mammal populations at the Site?

- ***Measurement Endpoint 3a:*** Compare modeled dietary COPEC exposure to TRVs (calculate HQs) for a piscivorous bird, great blue heron (*Ardea herodias*), using aquatic habitat at the Site.
- ***Measurement Endpoint 3b:*** Compare modeled dietary COPEC exposure to TRVs (calculate HQs) for a piscivorous mammal, mink (*Neovison vison*), using aquatic habitat at the Site.

Receptors listed in the measurement endpoints above were selected to represent the organisms that could be present most frequently or are likely to be sensitive to the effects of Site-related COPEC in sediment. Specific receptors for each assessment endpoint were selected based on the type of habitats identified within the Site, species observed while conducting activities within the Site, and those receptors that are particularly sensitive to COPEC in sediment.

4 EXPOSURE ASSESSMENT

Estimates of COPEC concentrations at points of potential exposure provide a basis for evaluating chemical intakes by potentially exposed receptors. The COPEC concentrations in the exposure medium at the exposure point are termed EPCs. The evaluation of Measurement Endpoint 1a and 1b relies on surface water and sediment EPCs to assess direct exposures to primary trophic level receptors (e.g., aquatic plants, aquatic invertebrates, and fish). Potential effects are evaluated via a direct comparison of EPCs to ecological benchmarks protective of the associated exposure medium.

As described above, the COPEC selection was conducted using the maximum detected concentration. This is a very conservative approach because receptor populations in surface water are not exposed to only the maximum concentration, but rather to an average of all concentrations present. As appropriate, based on the number of samples and detections, a 95% upper confidence level of the mean of the dataset (95% UCL) was calculated as the EPC for some COPEC to assess potential risk in accordance with risk assessment guidance (USEPA 1998).

The number of samples and frequency of constituent detection dictated the method by which the EPCs were derived, consistent with USEPA guidance (1997, 2006, 2010b). Specifically, the lower of the maximum detected concentration or the 95% UCL was used as the EPC. 95% UCLs were calculated for datasets that had at least 10 samples and at least five detections. 95% UCLs were calculated using ProUCL version 4.00.05. ProUCL output files are included as Appendix D. For datasets insufficient to calculate 95% UCLs (either too few samples or too few detections), the maximum detected concentrations were used as the EPC.

To evaluate potential effects to upper trophic level wildlife (e.g., mammals and birds) exposed to sediment (Measurement Endpoint 2, 3a, and 3b), a dose-exposure model was used to estimate the daily intake of COPEC by each receptor:

$$ADD = \frac{\{[(IR_f \times C_f) + (IR_s \times C_s)] \times SUF\}}{BW}$$

Where:

ADD = Average daily dose of COPEC (milligrams per kilogram [mg/kg]/day)

C_f = Concentration of a COPEC in food (mg/kg)

IR_f = Daily ingestion of food (kg/day)

C_s = Concentration of a COPEC in sediment (mg/kg)

IR_s = Daily incidental ingestion rate of sediment (kg/day)

SUF = Site use factor (unitless)

BW = Body weight (kg)

Exposure parameters for upper trophic level wildlife receptors include dietary and incidental media (e.g., sediment) ingestion rates, body weights, and dietary composition. These values were obtained from a variety of sources including USEPA's *Wildlife Exposure Factors Handbook* (USEPA

1993), Nagy (2001), USEPA (2007), Sample and Suter (1994), and Beyer et al. (1994). The site use factor was conservatively set to 1 for dose modeling using sediment. Exposure parameters for sediment dose modeling are presented in Table 3.

5 EFFECTS ASSESSMENT

The ecological effects assessment describes the potential adverse effects associated with ecological receptors exposure to COPEC, based on the selected assessment endpoints. As indicated in Section 4.1, exposures to primary trophic level receptors (i.e., aquatic plants, aquatic invertebrates, and fish) were evaluated via a direct comparison of EPCs to EBSLs protective of surface water (Table 1) and sediment (Table 2). To evaluate potential exposure of upper trophic level receptors (e.g., mammals and birds) to sediment a dose model was used and HQs were calculated (Tables 3-8).

Direct exposure risks to lower-trophic-level receptors (i.e., plants, terrestrial and aquatic invertebrates, and fish) are evaluated via a comparison of sediment or surface-water EPCs to available EBSLs used to represent threshold values below which adverse effects are unlikely. EBSL sources include:

- NJDEP ESC table (NJDEP 2009)
- Published peer-reviewed journal articles (e.g., Verbuggen et al. 2001; MacDonald et al. 2000).
- USEPA (2003) Region 5 Ecological Screening Levels.
- USEPA (2006) Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks.
- Michigan Department of Environmental Quality (MDEQ) Rule 57 Water Quality Values

5.1 Toxicological Properties of Metals

Chemical, physical, and biological factors influence the potential toxicity of metals. Metals exhibit a range of binding affinities with both organic (e.g., carbon) and inorganic (e.g., other metals) substances, so the concentration of bioavailable fractions of metals varies. The total concentration of metals is generally not predictive of their bioavailability. Dissolved (filtered) metals data better approximate the fraction of the metal that is available for uptake by aquatic organisms (i.e., bioavailable, not bound to suspended particulates) (International Council on Mining and Metals [ICMM] 2007; Meyer et al. 2007; USEPA 1993).

5.2 Potential Wildlife Effects

USEPA (2007) defines a TRV as a dose (based on laboratory toxicological investigations) above which a particular ecologically relevant effect may be expected to occur in an organism following chronic dietary exposure, and below which it is reasonably expected that such effects will not occur. Rather than deriving one point estimate associated with specific biological effects, both high and low TRVs are identified for each COPEC to bracket a threshold effect level.

The low TRV is a conservative value consistent with a chronic no observed adverse effects level (NOAEL). It represents a conservative dose level at or below which adverse effects are unlikely to occur. Conversely, the high TRV is a less conservative estimator of potential adverse effects, representing a dose level at which adverse effects may occur, and is consistent with a chronic LOAEL. As recommended by USEPA (1997), in the absence of either an NOAEL or LOAEL, the missing value was obtained by extrapolating from the existing value by a factor of 10.

The following literature sources were reviewed for the selection of TRVs for upper-trophic-level wildlife (i.e., birds and mammals):

- USEPA Ecological Soil Screening Level (EcoSSLs) (USEPA 2010)

When reviewing the toxicological literature and selecting the most appropriate study for TRV development, several factors were considered:

- Taxonomic relationship between the test animal and the receptor species.
- Use of laboratory animals or domesticated species, with preference for wildlife species.
- Toxicological studies where the chemical was administered through diet are preferred over studies using other dosing methods, such as oral gavage or intraperitoneal injection.
- Ecological relevance of the study endpoints. Studies with toxicity endpoints such as reproduction, growth, behavior, and developmental endpoints were targeted. Sensitive endpoints such as reproductive or developmental toxicity were preferentially selected because they are closely related to the selected AEs.
- Long-term studies representing chronic exposure were preferentially selected over short-term, acute studies.

The selected mammalian and avian TRVs are presented in Table 4.

6 RISK CHARACTERIZATION

The risk characterization combines the exposure assessment and effects assessment to evaluate potential ecological risk to receptors. For aquatic receptors (i.e., aquatic plants, aquatic invertebrates, and fish) risks were characterized by comparing surface water and sediment EPCs to EBSLs, which results in an HQ. An HQ is an expression of the ratio of an exposure estimate (i.e., EPC) to an effect concentration (i.e., EBSL) using information obtained from exposure and effects characterizations. In general, HQs less than 1 indicate that adverse effects are unlikely. With respect to HQs greater than 1, HQs must be interpreted relative to the assumptions on which the assessment is based. In other words, more conservative exposure and effects assumptions result in a broader range of tolerable HQs.

6.1 Groundwater to Surface Water Pathway

Table 9 summarizes the preliminary HQs in surface water resulting from this analysis, indicating total aluminum, total barium, total copper, total manganese and dissolved manganese for which the maximum concentration exceeded their respective EBSL. However, when the more realistic 95% UCL is considered, the HQs associated with total barium and total copper are 0.4 and 0.3, respectively, indicating limited risk in surface water (Table 10).

Total aluminum, total manganese, and dissolved manganese maintained an HQ greater than 1 when the 95% UCL was considered. However, as discussed in Section 5.1, total metals analysis likely overestimates the fraction of metals that is bioavailable. When the dissolved concentration of aluminum is considered, the maximum surface water concentration is below the EBSL. The dissolved manganese data will be prioritized over the total concentrations for this metal. The dissolved concentrations result in a HQ greater than one considering the 95th% UCL.

Although 1,4-dioxane has been noted in groundwater and surface water at the site, no detected concentrations were within three orders of magnitude of the ecologically based screening level for this constituent. Surface water data collected March 24, 2016 and analyzed for only 1,4-dioxane via method OSW-8270D were evaluated outside this report. It was determined that these data did not include a higher maximum concentration for 1,4-dioxane than what was already present in the data set from 2015. As such, they were not included.

NJDEP does not have an ecological screening value for 1,4-dioxane in surface water. As an alternate, an EBSL from MDEQ that was calculated to be protective of freshwater species was used to evaluate Site data (which was also the lowest EBSL for 1,4-dioxane identified from state agencies by Arcadis). The MDEQ calculation of the EBSL is included in Appendix E. Note, that even using the maximum reported concentration at any well or surface water/seep location, 1,4-dioxane does not occur at concentrations above the EBSL in either groundwater or surface water at the Site and therefore do not meet the definition of a COPEC (i.e., detected in both groundwater *and* surface water above an EBSL).

6.2 Sediment Pathway

Risks for upper trophic level species were calculated by comparison of the ADD described in Section 4 to the TRVs identified in Section 5. Two TRVs were evaluated for each COPEC and receptor

(Table 4), one representing a threshold value below which no effects are expected to occur (NOAEL) and the other a concentration at which some effects may occur (LOAEL). HQs < 1 indicate that adverse effects should not be expected; however, because the modeling of risks due to sediment exposure in this EA was based on conservative exposure parameters, an HQ >1 indicates only the potential for adverse effects and suggests the need for further analysis to confirm the potential and the magnitude of the potential risk.

A summary of the HQs obtained for each species is provided in Tables 5, 6, and 7. A summary of risks due to potential exposure to sediment is provided in Table 8.

For benthic invertebrates, most HQs are < 1 with the exception of, acetone, arsenic, manganese, and vanadium (Table 11). Calculated HQs range from 1 to 8 (Table 11). A number of COPECs were detected in a limited number of samples so a 95% UCL could not be calculated. These COPEC include 2-butanone, acenaphtyhlene, benzaldehyde, and antimony which were all detected in one of thirteen samples and beryllium which was detected in two of thirteen samples. Using the maximum detected concentration in sediment for these COPEC the HQs are still very low, ranging from 1 to 3 (no EBSL is available for benzaldehyde or beryllium) which indicates a very limited potential for ecological risk. Given that the majority of samples evaluated were non-detect for these COPEC, the potential for exposure in sediment is localized and therefore is not associated with any significant risk to ecological receptors.

Dose modeling was used to estimate potential exposures to upper level trophic receptors to COPECs in sediment. All detected bioaccumulative compounds were included in the dose modeling (USEPA 2000). A summary of the exposure parameters used in the model is presented in Table 3, the EPCs used in the model are provided in Table 4 and the HQs obtained for each species is provided in Tables 5, 6, and 7. A summary of risks due to potential exposure to sediment is provided in Table 8. As presented in Table 8, with the exception of potential copper and lead risks to tree swallow, all estimated HQs for aquatic-feeding species considering the LOAEL TRV are below 1 indicating limited potential risk to ecological receptors due to food chain exposure. With respect to the potential risks to tree swallows, it should be noted that the TRVs applied in this assessment are typically based on a single study, with a single organism, and a single constituent form and therefore represent a very conservative estimate of potential effects to organisms in the environment.

For example, the avian TRVs for lead used in the SLERA are based on data regarding potential reproductive effects in chickens exposed to lead acetate (Edens and Garlich 1983). Chickens are often more sensitive to the effects of environmental contamination than non-domesticated birds and lead acetate is a more soluble, and therefore more bioavailable, form of lead than would typically be found in the environment. Use of this TRV likely overestimates actual risks to receptors. As discussed in the BERA for CMP, PMP, and OCDA, refined TRVs can be defined as the geometric mean of those toxicological results reported for which both a NOAEL and LOAEL value (i.e., bounded values) were reported. Specifically, data considered as high quality (i.e., literature selected for EcoSSL development following USEPA methodology [2007]) in each EcoSSL document were evaluated. Focusing on the reproduction and growth endpoints for both mammalian and avian receptors, refined TRVs for copper and lead were defined as the geometric mean of those toxicological results reported for which both a NOAEL and LOAEL value (i.e., bounded values) were reported. These calculations, including a summary of the studies used, are presented in Appendix F by constituent. Using this approach, a refined NOAEL TRV of 7.3 milligrams per kilogram (mg/kg) body weight per day and the LOAEL TRV is 43 mg/kg body weight per day were identified for lead. A refined NOAEL TRV of 19.6 mg/kg body weight per day and the LOAEL TRV of 36 mg/kg body weight per day were identified for copper. Considering these potential TRV refinements, all LOAEL HQs for the tree swallow would be below 1 (Table 8). Based on these considerations, there is limited potential for significant risk to these receptors.

7 UNCERTAINTY

The understanding of the underlying uncertainties inherent in the data and the risk assessment approach is crucial to the appropriate interpretation of risk assessment results. The nature of a risk assessment mandates that the uncertainties are largely mitigated by making conservative assumptions to reduce the likelihood of overlooking or underestimating risks. Thus, a significant portion of the uncertainty discussed in this section relates to conservative assumptions.

These conservative assumptions, when taken together, result in predicted risk levels that are likely higher than those actually present at the Site. Alternatively, factors that may have resulted in underestimation of risk are also identified and discussed in the sections below.

Several sources of uncertainty were identified and include the following:

- Conservatism of screening values
- Constituents without screening values
- Constituents with reporting limits (RLs), or laboratory analytical detection limits, greater than the screening values
- Limitations of data set

The following sections describe these potential uncertainties in more detail.

7.1 Conservatism of Screening Values

The screening values used for the purpose of the COPEC screen and to calculate HQs for aquatic receptors are very conservative and meant to be used to show when effects may begin to occur. Many screening values are based on no observed adverse effect levels reported in the literature which indicate that although an animal was exposed at a given concentration, no effects were seen.

7.2 Constituents without Screening Values

Screening levels were unavailable for some constituents that were detected in groundwater, surface water, and sediment, including VOCs, SVOCs, and some metals (sediment only). However, the analytical results were typically non-detect at generally low detection limits. Screening levels are available for the majority of metals and those metals without screening levels are mostly essential nutrients that are required in the diet of plants and animals (e.g., calcium, iron, magnesium, potassium, sodium). The absence of screening levels for some of these organic and inorganic constituents leads to some uncertainty. For some constituents, the RL exceeds the EBSL; these situations are shown in Appendix B.

Elevated RLs in the samples are likely to be caused by matrix interferences and the need for sample dilution prior to analysis. However, the RL is likely to overestimate the actual concentration that is present. Given this uncertainty, evaluating potential risk based on detection limits is not reasonable. For that reason, only constituents with at least one detected concentration were included as COPEC.

7.3 Constituents with Detection Limits Greater Than the Screening Values

There are some instances where constituents have detection levels, or RLs, that are greater than their respective screening value. At this Site, an elevated RL for a constituent analytical result is likely to be caused by interference associated with the analytical method and the resultant need for sample dilution prior to analysis. However, although a result with a non-detect data qualifier indicates the RL, it is possible to detect concentrations of constituents lower than this value.

In those cases where constituents are detected at a concentration less than the RL, the result is reported with a "J" qualifier, indicating that the concentration detected below the RL is an estimated value. Therefore, if a constituent is not detected at or above the RL, yet it is assumed that the constituent actually occurs in the sample at a concentration equivalent to the RL value, the RL value is likely an overestimation of the constituent concentration that actually exists in that sample.

Evaluating potential risk based on the assumption that constituents reported as non-detect actually occur at the concentration represented by the RL, or detection level, is overly conservative and not scientifically defensible or reasonable given that the constituent is likely not present or occurs at a very low concentration below the RL. For these reasons, only constituents with at least one detected concentration above its respective EBSL were included as COPEC in the ecological risk evaluation.

8 SUMMARY AND CONCLUSIONS

The selection of surface water COPEC utilized in this EA was based on maximum concentrations reported in any one groundwater or surface water sample collected at the Site considering recent data (i.e., surface and groundwater collected as an annual Site-Wide sampling event in 2015 and groundwater data collected between 2014 and 2016). Similarly, sediment COPEC were selected using the maximum detected concentration regardless of the number of detections. This assessment is highly conservative because receptor populations in streams and ponds are not exposed to only the maximum concentration, but rather to an average of all concentrations present near a receptor. It is also highly conservative because maximum concentrations reported in any groundwater or surface water sample are not representative of a specific groundwater to surface water discharge pathway, rather, the numerical values are simply compared to their respective EBSL regardless of the well or surface water sample location. Final risk estimates considered more ecologically relevant 95% UCL concentrations when there was a sufficient number of samples in which the constituent was detected to calculate this statistic.

Using this numerical evaluation of groundwater and surface water concentrations to EBSLs, only five constituents occur at concentrations above their respective EBSL in both groundwater and surface water at the Site, specifically only total aluminum, total barium, total copper, total manganese and dissolved manganese. The Site-Related Groundwater RIR (Arcadis 2015a) found benzene and arsenic, in addition to lead, as "key Site constituents" in the CSM. That report indicated that arsenic and benzene were found at low concentrations in groundwater and surface water and impacts were limited in extent. Concentrations of these two compounds are likely to decrease over time due to natural attenuation.

It is also important to note that, even using the maximum reported concentration at any well or surface water/seep location, benzene, arsenic and lead do not occur at concentrations above their respective EBSLs in surface water at the Site, and only total lead occurs above the EBSL in groundwater. Therefore these three metals do not meet the definition of a COPEC. In addition, although 1,4-dioxane has been detected in groundwater and surface water at the Site, none of the concentrations were within three orders of magnitude of the ecologically based screening level for this constituent. NJDEP does not have an ecological screening value for 1,4-dioxane in surface water so an EBSL from the MDEQ that was calculated to be protective of freshwater species was used to evaluate this Site (See Appendix E). Note that, even using the maximum reported concentration at any well or surface water/seep location, 1,4-dioxane does not occur at concentrations above the EBSL in either groundwater or surface water at the Site and therefore does not meet the definition of a COPEC for purposes of this EA.

The pore water analytical results confirmed the conclusions made based on the preponderance of groundwater and surface water data generated during the RI that benzene in groundwater is not discharging to the surface water of Park Brook adjacent to or downgradient of the PMP Area. These findings are also consistent with the fact that benzene is not reported at levels above its EBSL in groundwater or surface water and therefore not of ecological concern.

Although benzene and arsenic have been reported in groundwater at the Site, the findings of this EA confirm the findings of the previous SLERA and BERA evaluations that benzene and arsenic in groundwater and surface water are not of ecological concern. This is also consistent with the findings of the GW RIR (Arcadis 2015a) which concluded no complete groundwater to surface water discharge pathway for these constituents and therefore no potential for risk to any ecological receptor on or downgradient of the Site.

With respect to the five COPEC selected in this EA for surface water: total aluminum, total barium, total copper, total manganese and dissolved manganese, the findings of this EA indicate that total barium and total copper were eliminated as risk drivers when the more realistic and ecologically relevant 95% UCL is considered indicating no unacceptable risk associated with these total metals as all calculated HQs were below 1.

Total aluminum, total manganese, and dissolved manganese maintained an HQ greater than 1 when the 95% UCL was considered. However, as discussed in Section 5.1, total metals analysis likely overestimates the fraction of metals that is bioavailable to an organism. When the dissolved concentration of aluminum is considered, the maximum surface water concentration is below the EBSL indicating risk is unlikely. The dissolved manganese data represent the more relevant concentrations for this metal. Dissolved manganese analysis was performed only on samples collected in August 2015, which, for the upstream/background sample locations, includes PAB-00 and MRB-00, only. The dissolved (filtered) manganese concentrations for these samples were 2.6 µg/L (PAB-00_ and 45 µg/L (MRB-00). Surface water sample results for manganese from samples collected in the areas of concern are typically an order of magnitude greater than the upstream/background locations. However, total metals results for manganese for PAB-00 and MRB-00 from 2015 are consistent with the manganese sample results for SW-1 (Mine Brook) and SW-8 (Park Brook) collected in July 1984 and April 1985. The SW-1 and SW-8 locations are close to their corresponding locations MRB-00 and PAB-00. It should be noted that the upstream/background locations are not near any of the iron mines or iron ore bodies, which are known sources of manganese.

As discussed above, benzene, arsenic and lead are the "key Site constituents" linked to historical Site usage and manganese has never been considered a risk driver. The presence of manganese in water is understood at the Site, as well as at upgradient, background well locations. Elevated concentrations of manganese in water is likely reflective of native soil and bedrock, historical mining, and local groundwater geochemical conditions (Arcadis 2015a). As such, any ecological impacts due to the presence of manganese in water are likely associated with these natural conditions and not Site operations.

Although a number of COPEC were selected in Site sediment using the maximum detected concentrations, most COPEC were eliminated as risk drivers when the more realistic and ecologically relevant 95% UCL was considered. When the 95% UCL is considered most HQs are < 1 with the exception of acetone, arsenic, manganese, and vanadium (Table 11). Calculated HQs range from 1 to 8 (Table 11). A number of COPECs were detected in a limited number of samples so a 95% UCL could not be calculated. These COPEC include 2-butanone, acenaphthylene, benzaldehyde, and antimony which were all detected in one of thirteen samples and beryllium which was detected in two of thirteen samples. Using the maximum detected concentration in sediment for these COPEC the HQs are still very low, ranging from 1 to 3 (no EBSL is available for benzaldehyde or beryllium) which indicates a limited potential for ecological risk. Given that the majority of samples evaluated were non-detect for these COPEC, the potential for exposure in sediment is localized and therefore is not associated with any significant risk to ecological receptors.

Dose modeling was used to estimate potential exposures to upper level trophic receptors to COPECs in sediment. All bioaccumulative compounds were included in the dose modeling (USEPA 2000). As presented in Table 8, with the exception of lead and copper for tree swallows, all estimated HQs for aquatic-feeding species considering the ecologically relevant LOAEL are below 1 indicating no significant risk to ecological receptors due to food chain exposure. Considering refined avian TRVs for those compounds, all LOAEL HQs are below 1 (Table 8).

Based on the results of this assessment, the potential for ecological risks associated with the five COPEC reported in both groundwater and surface water or additional COPEC selected in sediment is low and no further evaluation is warranted. Risks to lower trophic level organisms (as shown through direct screening) and upper trophic level receptors (via dose modeling) are minimal. This conclusion is consistent with the evaluation of groundwater and surface water in relation to each land-based AC as documented in the prior SLERA and BERAs that were approved by the USEPA for the CMP Area, PMP Area, and OCDA. These evaluations concluded that the potential ecological risk associated with the land-based ACs, including soil, sediment, surface water, and groundwater, was acceptable and that no further action was required.

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TABLES

Table 1
Comparison of Groundwater and Surface Water Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
Polychlorinated Biphenyls (PCBs)										
Aroclor-1016	µg/L	--		0/60			0/14			
Aroclor-1221	µg/L	--		0/60			0/14			
Aroclor-1232	µg/L	--		0/60			0/14			
Aroclor-1242	µg/L	--		0/60			0/14			
Aroclor-1248	µg/L	--		0/60			0/14			
Aroclor-1254	µg/L	--		2/60	1.3		0/14			
Aroclor-1260	µg/L	--		0/60			0/14			
Total PCBs	µg/L	--		1/60	1.3		0/14			
Volatile Organic Compounds (VOCs)										
1,1,1-Trichloroethane	µg/L	76	(c)	0/90			0/24			
1,1,2,2-Tetrachloroethane	µg/L	380	(c)	0/90			0/24			
1,1,2-trichloro-1,2,2-trifluoroethane	µg/L	--		0/90			0/24			
1,1,2-Trichloroethane	µg/L	500	(c)	0/90			0/24			
1,1-Dichloroethane	µg/L	--		29/97	2		1/24	1.4		
1,1-Dichloroethene	µg/L	65	(c)	0/90			0/24			
1,2,4,5-Tetrachlorobenzene	µg/L	--		0/62			0/14			
1,2-Dibromo-3-chloropropane	µg/L	--		0/90			0/24			
1,2-Dibromoethane	µg/L	--		0/90			0/24			
1,2-Dichlorobenzene	µg/L	14	(c)	1/91	0.53		0/24			
1,2-Dichloroethane	µg/L	910	(c)	3/90	0.27		0/24			
1,2-Dichloropropane	µg/L	360	(c)	0/90			0/24			
1,3-Dichlorobenzene	µg/L	38	(c)	1/91	1.7		0/24			
1,4-Dichlorobenzene	µg/L	9.4	(c)	8/94	4.2		0/24			
2-Butanone	µg/L	--		10/92	29		0/24			
2-Hexanone	µg/L	--		1/90	1.3		0/24			
4-Methyl-2-pentanone	µg/L	--		2/90	1		0/24			
Acetone	µg/L	--		25/101	86.1		0/24			
Bromochloromethane	µg/L	--		0/18			0/6			
Bromodichloromethane	µg/L	--		0/90			0/24			
Bromoform	µg/L	230	(c)	0/90			0/24			
Bromomethane	µg/L	16	(c)	0/90			0/24			
Carbon Disulfide	µg/L	--		18/96	63		0/24			
Carbon Tetrachloride	µg/L	240	(c)	0/90			0/24			
Chlorobenzene	µg/L	47	(c)	9/93	18.9		0/24			
Chloroethane	µg/L	--		37/102	89.4		6/24	11		
Chloroform	µg/L	140	(c)	2/92	0.59		0/24			
Chloromethane	µg/L	--		4/93	0.46		1/24	0.6		

Table 1
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Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
cis-1,2-Dichloroethene	µg/L	590	(i)	6/91	0.63		4/24	1.9		
cis-1,3-Dichloropropene	µg/L	--		0/90			0/24			
Volatile Organic Compounds (VOCs)										
Cyclohexane	µg/L	--		13/13	3.1		0/24			
Dibromochloromethane	µg/L	--		0/90			0/24			
Dichlorodifluoromethane	µg/L	--		1/90	0.19		0/24			
Isopropylbenzene	µg/L	--		25/102	8.9		1/24	0.38		
Methyl acetate	µg/L	--		0/90			0/24			
Methylcyclohexane	µg/L	--		30/101	1.6		0/24			
Methylene Chloride	µg/L	940	(c)	4/90	0.35		0/24			
Styrene	µg/L	32	(c)	0/90			0/24			
Tetrachloroethene	µg/L	45	(c)	0/90			0/24			
trans-1,2-Dichloroethene	µg/L	970	(c)	0/90			0/24			
trans-1,3-Dichloropropene	µg/L	--		0/90			0/24			
Trichloroethene	µg/L	47	(c)	0/90			0/24			
Trichlorofluoromethane	µg/L	--		0/90			0/24			
Vinyl Chloride	µg/L	930	(c)	0/90			1/24	0.47		
Benzene	µg/L	114	(c)	51/107	88.1		6/24	2.4		
Toluene	µg/L	253	(c)	24/103	18.4		1/24	0.33		
Ethylbenzene	µg/L	14	(c)	9/93	3.3		0/24			
Xylenes (total)	µg/L	27	(c)	16/100	180	Yes	3/24	2.8		
Methyl tert-butyl ether	µg/L	51000	(f)	8/93	0.38		0/24			
Semivolatile Organic Compounds (SVOCs)										
1,2,3-Trichlorobenzene	µg/L	--		0/18			0/6			
1,2,3-Trichloropropane	µg/L	--		0/62			0/14			
1,2,4-Trichlorobenzene	µg/L	30	(c)	0/90			0/24			
1,4-Dioxane	µg/L	22000	(k)	32/80	38		13/20	3.56		
2,2'-Oxybis(1-Chloropropane)	µg/L	--		0/62			0/14			
2,3,4,6-Tetrachlorophenol	µg/L	--		0/62			0/14			
2,4,5-Trichlorophenol	µg/L	--		0/62			0/14			
2,4,6-Trichlorophenol	µg/L	4.9	(c)	0/62			0/14			
2,4-Dichlorophenol	µg/L	11	(c)	0/62			0/14			
2,4-Dimethylphenol	µg/L	100	(c)	0/62			0/14			
2,4-Dinitrophenol	µg/L	19	(c)	4/62	6.8		0/14			
2,4-Dinitrotoluene	µg/L	44	(c)	0/62			0/14			
2,6-Dinitrotoluene	µg/L	--		0/62			0/14			
2-Chloronaphthalene	µg/L	0.396	(c)	0/62			0/14			
2-Chlorophenol	µg/L	24	(c)	0/62			0/14			

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Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
2-Methylnaphthalene	µg/L	330	(c)	3/65	0.88		0/14			
2-Methylphenol	µg/L	--		0/62			0/14			
2-Nitroaniline	µg/L	--		0/62			0/14			
Semivolatile Organic Compounds (SVOCs)										
2-Nitrophenol	µg/L	--		0/62			0/14			
3,3'-Dichlorobenzidine	µg/L	4.5	(c)	0/62			0/14			
3-Methylphenol, 4-Methylphenol	µg/L	--		0/62			0/14			
3-Nitroaniline	µg/L	--		0/62			0/14			
4,6-Dinitro-2-methylphenol	µg/L	--		0/62			0/14			
4-Bromophenyl-phenylether	µg/L	--		0/62			0/14			
4-Chloro-3-Methylphenol	µg/L	--		0/62			0/14			
4-Chloroaniline	µg/L	--		0/62			0/14			
4-Chlorophenyl-phenylether	µg/L	--		0/62			0/14			
4-Nitroaniline	µg/L	--		0/62			0/14			
4-Nitrophenol	µg/L	60	(c)	0/62			0/14			
Acenaphthene	µg/L	38	(c)	9/71	0.491		0/14			
Acenaphthylene	µg/L	4840	(c)	0/62			0/14			
Acetophenone	µg/L	--		9/70	2.4		0/14			
Anthracene	µg/L	0.035	(c)	1/63	0.147	Yes	0/14			
Atrazine	µg/L	--		0/62			0/14			
Benzaldehyde	µg/L	--		0/62			0/14			
Benzo(a)anthracene	µg/L	0.025	(c)	0/60			0/13			
Benzo(a)pyrene	µg/L	0.014	(c)	0/60			0/13			
Benzo(b)fluoranthene	µg/L	9.07	(c)	0/60			0/13			
Benzo(g,h,i)perylene	µg/L	7.64	(c)	0/62			0/14			
Benzo(k)fluoranthene	µg/L	--		0/62			0/14			
bis(2-Chloroethoxy)methane	µg/L	--		0/62			0/14			
bis(2-Chloroethyl)ether	µg/L	1900	(c)	2/62	3.4		0/14			
bis(2-Ethylhexyl)phthalate	µg/L	77	(h)	12/69	59.3		0/14			
Butylbenzylphthalate	µg/L	23	(c)	0/62			0/14			
Caprolactam	µg/L	--		1/63	1.2		0/14			
Carbazole	µg/L	--		0/62			0/14			
Chrysene	µg/L	--		0/62			0/14			
Cyclohexane	µg/L	--		13/13	3.1		0/24			
Dibenzo(a,h)anthracene	µg/L	--		0/62			0/14			
Dibenzofuran	µg/L	--		0/62			0/14			
Diethylphthalate	µg/L	110	(c)	0/62			0/14			
Dimethylphthalate	µg/L	--		1/63	6.9		0/14			

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Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
Di-n-Butylphthalate	µg/L	9.7	(c)	12/74	4.7		0/14			
Di-n-Octylphthalate	µg/L	--		3/65	5.7		0/14			
Diphenyl ether	µg/L	--		0/62			0/14			
Fluoranthene	µg/L	1.9	(c)	0/62			0/14			
Semivolatile Organic Compounds (SVOCs)										
Fluorene	µg/L	19	(c)	5/67	0.494		0/14			
Hexachlorobenzene	µg/L	0.0003	(c)	0/60			0/13			
Hexachlorobutadiene	µg/L	0.053	(c)	0/60			0/13			
Hexachlorocyclopentadiene	µg/L	77	(c)	0/62			0/14			
Hexachloroethane	µg/L	8	(c)	0/62			0/14			
Indeno(1,2,3-cd)pyrene	µg/L	4.31	(c)	0/62			0/14			
Isophorone	µg/L	920	(c)	3/65	3.8		0/14			
Naphthalene	µg/L	13	(c)	18/76	5.6		0/14			
Nitrobenzene	µg/L	220	(c)	0/62			0/14			
N-Nitrosodimethylamine	µg/L	--		0/60			0/13			
N-Nitroso-di-n-propylamine	µg/L	--		0/62			0/14			
N-Nitrosodiphenylamine	µg/L	--		7/69	1.5		0/14			
Pentachlorophenol	µg/L	--		1/53	0.1		1/13	0.11		
Phenanthrene	µg/L	3.6	(c)	10/72	0.716		0/14			
Phenol	µg/L	180	(c)	18/69	15.1		0/14			
Pyrene	µg/L	0.3	(c)	0/62			0/14			
Metals - Total										
Aluminum	µg/L	87	(i)	107/120	29200	Yes	12/14	600	Yes	Yes
Antimony	µg/L	80	(c)	3/63	3.1		1/14	1.3		
Arsenic	µg/L	150	(d) (e)	70/92	31		9/14	4.7		
Barium	µg/L	220	(c)	138/138	1050	Yes	14/14	270	Yes	Yes
Beryllium	µg/L	3.6	(c)	1/63	3		0/14			
Cadmium	µg/L	0.17	(a)	6/67	13.7	Yes	0/14			
Calcium	µg/L	--	(j)	148/148	457000		14/14	49400		
Chromium	µg/L	42	(c)	65/95	191	Yes	4/14	2.7		
Cobalt	µg/L	24	(c)	48/84	30	Yes	6/14	3.4		
Copper	µg/L	5.56	(a)	71/99	307	Yes	6/14	6.1	Yes	Yes
Iron	µg/L	--	(j)	141/142	127000		14/14	74400		
Lead	µg/L	5.4	(d) (e)	49/85	104	Yes	10/14	4.3		
Magnesium	µg/L	--	(j)	129/142	39500		14/14	12800		
Manganese	µg/L	120	(i)	138/147	15700	Yes	19/19	1800	Yes	Yes
Mercury	µg/L	0.77	(d) (e)	3/64	0.18		0/14			
Nickel	µg/L	31.24	(a)	113/118	68.7	Yes	6/14	4.6		

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Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
Potassium	µg/L	--	(j)	138/138	232000		14/14	8400		
Selenium	µg/L	5	(d)	35/80	24	Yes	2/14	0.74		
Silver	µg/L	0.12	(c)	34/96	10.2	Yes	0/14			
Sodium	µg/L	--	(j)	138/148	371000		14/14	61700		
Thallium	µg/L	10	(c)	13/64	3.8		3/14	1.1		
Metals - Total										
Vanadium	µg/L	12	(c)	85/110	40	Yes	4/14	4.8		
Zinc	µg/L	71.69	(a)	50/100	14500	Yes	1/14	39		
Metals - Dissolved										
Aluminum	µg/L	87	(i)	77/110	4800	Yes	3/14	16		
Antimony	µg/L	80	(c)	19/61	1.4		11/14	3.2		
Arsenic	µg/L	150	(d) (e)	57/87	19		4/14	0.65		
Barium	µg/L	220	(c)	136/136	1200	Yes	14/14	180		
Beryllium	µg/L	3.6	(c)	0/61			0/14			
Cadmium	µg/L	0.17	(a)	2/62	0.9	Yes	0/14			
Calcium	µg/L	--	(j)	147/147	485000		14/14	49300		
Chromium	µg/L	42	(c)	29/77	179	Yes	1/14	3		
Cobalt	µg/L	24	(c)	36/78	28	Yes	3/14	1.2		
Copper	µg/L	5.56	(a)	36/79	13	Yes	6/14	1.5		
Iron	µg/L	--	(j)	110/127	94500		13/14	840		
Lead	µg/L	5.4	(d) (e)	20/73	3.7		0/14			
Magnesium	µg/L	--	(j)	125/139	123000		14/14	13100		
Manganese	µg/L	120	(i)	113/121	14200	Yes	14/14	1500	Yes	Yes
Mercury	µg/L	0.77	(d) (e)	1/62	0.085		0/14			
Nickel	µg/L	31.24	(a)	93/104	900	Yes	9/14	8.7		
Potassium	µg/L	--	(j)	137/137	209000		14/14	8300		
Selenium	µg/L	5	(d)	30/78	22.3	Yes	0/14			
Silver	µg/L	0.12	(c)	33/94	9	Yes	0/14			
Sodium	µg/L	--	(j)	136/146	382000		14/14	64300		
Thallium	µg/L	10	(c)	9/61	2.9		4/14	0.88		
Vanadium	µg/L	12	(c)	49/89	40	Yes	0/14			
Zinc	µg/L	71.69	(a)	34/90	6720	Yes	2/14	23		
Miscellaneous										
Alkalinity	µg/L	--		153/153	1900000		20/20	147000		
Alkalinity, Bicarbonate	µg/L	--		59/71	401000		14/14	147000		
Alkalinity, Carbonate	µg/L	--		10/10	332000		--			
Bromide	µg/L	--		3/16	1870		0/6			
Chloride	µg/L	--		136/142	2190000		20/20	126000		

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Chemical	Units	Ecologically Based Screening Levels (EBSLs)		2014-2016 Site-Wide Groundwater (GW) Samples			2016 Site-Wide Surface Water (SW) Samples			SW COPEC?
		Chronic	Notes	Detection Frequency	Maximum Detect	Max > SL?	Detection Frequency	Maximum Detect	Max > SL?	COPEC Detected in GW and SW > SL
Cyanide	µg/L	--		6/62	16		0/14			
Fluoride, Total	µg/L	--		8/16	130		6/6	65		
Methane	µg/L	--		18/18	44000		6/6	6700		
Nitrate and Nitrite	µg/L	--		5/26	670		1/6	25		
Nitrate-N	µg/L	--		3/18	100		0/6			
Nitrite	µg/L	--		4/28	670		0/6			
Miscellaneous										
Sulfate	µg/L	--		104/119	472000		18/20	7160		
Sulfide	µg/L	--		3/18	5500		0/6			
Total Dissolved Solids	µg/L	--		10/10	413000		--			
Total Kjeldahl Nitrogen	µg/L	--		15/18	1600		2/6	330		
Total Organic Carbon	µg/L	--		18/18	9300		6/6	4300		

General Notes:

Results are reported in micrograms per liter (µg/L).

NJ surface water values (http://www.nj.gov/dep/rules/rules/njac7_9b.pdf) were used as screening criteria.

Footnotes:

(a) = Criteria can be calculated following formula f3.
(b) = Criteria can be calculated following formula f4.
(c) = U.S. Environmental Protection Agency (USEPA) Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.
(d) = Criterion is expressed as a function of the Water Effects Ratio.
(e) = Dissolved criterion.
(f) = USEPA Ambient Water Quality Criteria Update for Methyl Tertiary-Butyl Ether (MTBE) http://www.epa.gov/waterscience/criteria/mtbe-fs.html
(g) = Metals results are for unfiltered samples
(h) = Value is lowest NOEC reported for growth, survival, or reproduction endpoints from USEPA ECOTOX Database (http://cfpub.epa.gov/ecotox/quick_query.htm), original study Rhodes et. al. (1995).
(i) = Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (USEPA 2006)
(j) = Chemical considered an essential nutrient; therefore a screening level is not necessary
(k) = Michigan Department of Envornmental Quality (MDEQ) Rule 57 Water Quality Values

Acronyms and Abbreviations:

-- = value not available.
> = greater than
COPEC = constituents of potential ecological concern
GW = groundwater
Max = maximum
SL = screening level
SW = surface water

Table 2
Summary of Sediment Hazard Quotients Using Maximum Detected Concentration of Site-wide Data Set
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Constituent	NJDEP Freshwater Sediment Quality Guidelines		Frequency of Detection	Maximum Detected Concentration	Hazard Quotient Max	COPEC	Bioaccumulative per USEPA 2000
	LEL	Notes					
Volatile Organic Compounds (VOCs)							
2-Butanone	0.0424	(a)	1/13	0.127	3	Y	
Acetone	0.0099	(a)	5/13	0.278	28	Y	
Carbon Disulfide	0.0239	(a)	1/13	0.0011	0.05	N	
Methyl acetate	--	--	6/13	0.174	NA	Y	
Semivolatile Organic Compounds (SVOCs)							
Acenaphthylene	0.044	(b)	1/13	0.0558	1	Y	Y
Anthracene	0.22	--	1/13	0.0532	0.2	N	Y
Benzaldehyde	--	--	1/13	0.0883	NA	Y	
Benzo(a)anthracene	0.32	--	7/13	0.206	0.6	N	Y
Benzo(a)pyrene	0.37	--	6/13	0.228	0.6	N	Y
Benzo(b)fluoranthene	10.4	(a)	7/13	0.157	0.02	N	Y
Benzo(g,h,i)perylene	0.17	(a)	6/13	0.119	0.7	N	Y
Benzo(k)fluoranthene	0.24	(a)	2/13	0.169	0.7	N	Y
bis(2-Ethylhexyl)phthalate	0.182	(a)	4/13	0.371	2	Y	
Chrysene	0.34	--	8/13	0.286	0.8	N	Y
Dibenzo(a,h)anthracene	0.06	--	2/13	0.00662	0.1	N	Y
Dimethylphthalate	1	(d)	1/13	0.0839	0.08	N	
Fluoranthene	0.75	--	8/13	0.364	0.5	N	Y
Indeno(1,2,3-cd)pyrene	0.2	--	6/13	0.0976	0.5	N	Y
Naphthalene	0.16	(b)	1/13	0.00703	0.04	N	
Phenanthrene	0.56	--	7/13	0.267	0.5	N	
Pyrene	0.49	--	8/13	0.526	1	Y	Y
Polychlorinated Biphenyls (PCBs)							
Aroclor-1242	0.035	(e)	1/13	0.0078	0.2	N	Y
Aroclor-1254	0.035	(e)	4/13	0.0257	0.7	N	Y
Aroclor-1260	0.035	(e)	4/13	0.0196	0.6	N	Y
Metals							
Aluminum	25500	2.55%(c)	13/13	30000	1	Y	
Antimony	3	SEL	1/13	4.1	1	Y	
Arsenic	6	--	13/13	71.6	12	Y	Y
Barium	7000	(d)	12/13	250	0.04	N	
Beryllium	--	--	2/13	0.93	NA	Y	
Cadmium	0.6	--	2/13	4.9	8	Y	Y
Calcium	--	--	13/13	50900	NA	Nutrient	
Chromium	26	--	13/13	51.7	2	Y	Y
Cobalt	50	(a)	10/13	43.2	0.9	N	
Copper	16	--	13/13	141	9	Y	Y
Iron	--	--	13/13	125000	NA	Nutrient	
Lead	31	--	13/13	384	12	Y	Y
Magnesium	--	--	13/13	14100	NA	Nutrient	
Manganese	630	(c)	13/13	3170	5	Y	
Mercury	0.2	--	9/13	0.5	3	Y	
Nickel	16	--	12/13	82.9	5	Y	Y
Potassium	--	--	10/13	3740	NA	Nutrient	
Sodium	--	--	6/13	1770	NA	Nutrient	
Vanadium	57	(b)	13/13	163	3	Y	
Zinc	120	--	13/13	561	5	Y	Y

Notes:
Results are reported in milligrams per kilogram (mg/kg)
COPEC = Constituent of Potential Ecological Concern
PCBs = Polychlorinated biphenyls.
VOCs = Volatile organic compounds.
SVOCs = Semi-volatile organic compounds.
NJDEP = New Jersey Department of Environmental Protection
LEL = Lowest Effects Level
SEL = Severe Effects Level
NA = Not applicable
Nutrient = Essential nutrient, not considered a COPEC
-- = Value not available
(a) = Resource Conservation and Recovery Act Region 5 Ecological Screening Level (United States Environmental Protection Agency [USEPA] 2003)
(b) = Screening values sourced from Citation (a) were developed for the protection of marine receptors; however they are considered surrogates for fresh water
(c) = Sediment value from the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs)
(d) Verbruggen et al. 2001
(e) PCB LEL from MacDondald et. al. 2000

Table 3
Exposure Parameters for Aquatic-Feeding Species
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Common Name	Scientific Name	Body Weight (kg)	Notes	Dietary Composition (%) (i)			Daily Ingestion Rate (kg/day ww)	Notes	Daily Ingestion Rate (kg/day dw)	Notes	Soil/Sediment Ingestion (%)	Notes	Soil/Sediment Ingestion Rate (kg/day dw)	Notes
				Plants	Inverts	Tissue								
Aquatic Species														
Tree swallow	*Tachycineta bicolor*	0.0202	a		100%		0.0352	a	0.011600	a	<2.0%	j	0.000232	h
Great blue heron	*Ardea herodias*	2.34	c			100%	0.42	c	0.134784	e	<2.0%	j	0.002696	i
Mink	*Neovison vison*	0.8961	c			100%	0.1	c	0.04516	e	<2.0%	j	0.000903	i

Notes:
(a) Nagy 2001
(c) USEPA 1993
(e) Daily ingestion rates converted to dry weight assuming a moisture content of the following (USEPA 2007):
Inverts: 84%
Tissue: 68%
Plants: 85%
(g) Based on American woodcock (Beyer et al. 1994 and USEPA 2007)
(h) Calculated by multiplying the soil ingestion rate times the dry weight daily ingestion rate
(i) American robin dietary composition from Howell (1942) as modified by Chapman (1999)
(j) Levy and Karasov (1989) as modified by Chapman (1999). Value shown is converted from 0.38 kg/kg-bw-d ww to 0.029 kg/day ww by multiplying by body weight
invert = Invertebrate
kg = Kilogram
kg/day dw = Kilograms per day dry weight
kg/day ww = Kilograms per day wet weight
kg/kg-bw-d ww = Kilograms per kilogram body weight per day wet weight

Table 4
Toxicity Reference Values for Aquatic-Feeding Species
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

COPEC	TRVs (mg/kg/d)							
	Mammals				Birds			
	NOAEL	Notes	LOAEL	Notes	NOAEL	Notes	LOAEL	Notes
Semivolatile Organic Compounds (SVOCs)								
Acenaphthylene	65.6	a	656	a	1653	a	16530	a
Anthracene	65.6	a	656	a	1653	a	16530	a
Benzo(a)anthracene	0.615	a	6.15	a	2	a	20	a
Benzo(a)pyrene	0.615	a	6.15	a	2	a	20	a
Benzo(b)fluoranthene	0.615	a	6.15	a	2	a	20	a
Benzo(g,h,i)perylene	0.615	a	6.15	a	2	a	20	a
Benzo(k)fluoranthene	0.615	a	6.15	a	2	a	20	a
Chrysene	0.615	a	6.15	a	2	a	20	a
Dibenzo(a,h)anthracene	0.615	a	6.15	a	2	a	20	a
Fluoranthene	0.615	a	6.15	a	2	a	20	a
Indeno(1,2,3-cd)pyrene	0.615	a	6.15	a	2	a	20	a
Pyrene	0.615	a	6.15	a	2	a	20	a
Polychlorinated biphenyls								
Total PCBs	0.004	b	0.04	b	1.8	c	7.1	c
Metals								
Arsenic	1.04	a	1.66	a	2.24	a	22.4	a
Cadmium	0.77	a	7.7	a	1.47	a	14.7	a
Chromium	2.4	a	24	a	2.66	a	26.6	a
Copper	5.6	a	9.34	a	4.05	a	12.1	a
Copper-Refined	--		--					
Lead	4.7	a	8.9	a	1.63	a	3.26	a
Lead Refined	--		--					
Nickel	1.7	a	3.4	a	6.71	a	67.1	a
Zinc	75.4	a	754	a	66.1	a	661	a

Notes:

a. Eco SSLs (USEPA 2010). EcoSSLs identify the NOAEL; the LOAEL is from either the corresponding study, or is extrapolated from the NOAEL using a multiplying factor of 10.

b. Restum et al. 1998. Field-based study of mink.

c. Dahlgren et al., 1972. Laboratory-based evaluation of pheasant.

COPEC = Constituent of potential ecological concern

EcoSSLs = Ecological Soil Screening Levels

LOAEL = Lowest observed adverse effects level

mg/kg/d = Milligrams per kilogram per day

NA = Value not available

NOAEL = No observed adverse effects level

TRV = Toxicity reference value

USEPA = United States Environmental Protection Agency

Table 5
Hazard Quotients for Tree Swallow Based on Estimated Tissue Concentrations in Food
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

COPEC	Sediment EPC (mg/kg)	Body Weight (kg)	Dietary Composition Inverts	$BSAF_{invert}$	C_{invert} (mg/kg)	Daily Ingestion Rate (kg/day dw)	Sediment Ingestion Rate (kg/day dw)	Daily Dietary Dose (mg/kg/d)	TRV (mg/kg/d)		HQ	
									NOAEL	LOAEL	NOAEL	LOAEL
Semivolatile Organic Compounds (SVOCs)												
Acenaphthylene	0.05580	0.0202	100%	(0.691*[Cs]*flipid) / foc	0.116	0.012	0.00023	0.0671	1653	16530	0.000041	0.0000041
Anthracene	0.05320	0.0202	100%	(0.502*[Cs]*flipid) / foc	0.080	0.012	0.00023	0.0466	1653	16530	0.000028	0.0000028
Benzo(a)anthracene	0.10400	0.0202	100%	(0.619*[Cs]*flipid) / foc	0.193	0.012	0.00023	0.1121	2	20	0.06	0.006
Benzo(a)pyrene	0.11100	0.0202	100%	(0.272*[Cs]*flipid) / foc	0.091	0.012	0.00023	0.0533	2	20	0.03	0.003
Benzo(b)fluoranthene	0.07580	0.0202	100%	(0.2*[Cs]*flipid) / foc	0.045	0.012	0.00023	0.0270	2	20	0.01	0.001
Benzo(g,h,i)perylene	0.06770	0.0202	100%	(0.068*[Cs]*flipid) / foc	0.014	0.012	0.00023	0.0087	2	20	0.004	0.0004354
Benzo(k)fluoranthene	0.16900	0.0202	100%	(1.32*[Cs]*flipid) / foc	0.667	0.012	0.00023	0.3848	2	20	0.2	0.02
Chrysene	0.20300	0.0202	100%	(0.397*[Cs]*flipid) / foc	0.242	0.012	0.00023	0.1412	2	20	0.07	0.007
Dibenzo(a,h)anthracene	0.00662	0.0202	100%	(0.148*[Cs]*flipid) / foc	0.003	0.012	0.00023	0.0018	2	20	0.000882	0.0000882
Fluoranthene	0.25500	0.0202	100%	(1.26*[Cs]*flipid) / foc	0.960	0.012	0.00023	0.5543	2	20	0.3	0.03
Indeno(1,2,3-cd)pyrene	0.03360	0.0202	100%	(0.121*[Cs]*flipid) / foc	0.012	0.012	0.00023	0.0074	2	20	0.004	0.0003695
Pyrene	0.34200	0.0202	100%	(0.569*[Cs]*flipid) / foc	0.584	0.012	0.00023	0.3392	2	20	0.2	0.02
Polychlorinated biphenyls												
Total PCBs	0.05310	0.0202	100%	0.53	0.028	0.012	0.00023	0.0168	1.8	7.1	0.009	0.002
Metals												
Arsenic	47.13	0.0202	100%	e^(0.706*LN(Cs)-1.421)	3.67	0.012	0.00023	2.65	2.24	22.4	1	0.1
Cadmium	4.9	0.0202	100%	e^(0.795*LN(Cs)+2.114)	29.29574	0.012	0.00023	16.88	1.47	14.7	**11**	1
Chromium	24.36	0.0202	100%	0.306*(Cs)	7.5	0.012	0.00023	4.56	2.66	26.6	**2**	0.2
Copper	59.73	0.0202	100%	0.515*(Cs)	30.8	0.012	0.00023	18.35	4.05	12.1	**5**	**2**
Lead	122.7	0.0202	100%	e^(0.807 * LN(Cs) - 0.218)	39	0.012	0.00023	23.80	1.63	3.26	**15**	**7**
Nickel	43.74	0.0202	100%	e^(7.033-1.548*LN(Cs))	3.268231	0.012	0.00023	2.38	6.71	67.1	0.4	0.04
Zinc	257.1	0.0202	100%	e^(0.328 * LN(Cs) + 4.449)	528.07	0.012	0.00023	306.20	66.1	661	**5**	0.5

Notes:

Bold cells indicate an HQ > 1

BSAF = Biota-sediment accumulation factor
Cinvert = Concentration in invertebrate
COPEC = Constituent of potential ecological concern
Cs = Concentration in soil/sediment
EPC = Exposure point concentration
HQ = Hazard quotient
invert = Invertebrate
kg = Kilogram
kg/day dw = Kilograms per day dry weight
LOAEL = Lowest observed adverse effects level
mg/kg = Milligrams per kilogram
mg/kg/d = Milligrams per kilogram per day
NOAEL = No observed adverse effects level
TRV = Toxicity reference value
f_{lipid} = percent lipid body composition; assumes 3% for inverts and 5% for fish
foc = fraction organic carbon; conservatively assumed to be 1% per Long and Morgan 1991

BSAFs sourced from:

SVOCs: USEPA BSAF database; value is the mean value for each individual PAH across various freshwater sites for whole body fish tissue data.
Metals: Bechtel Jacobs 1998.
PCBs: EPA 1999

Table 6
Hazard Quotients for Mink Based on Estimated Tissue Concentrations in Food
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

COPEC	Sediment EPC (mg/kg)	Body Weight (kg)	Dietary Composition Fish	$BSAF_{fish}$	C_{fish} (mg/kg)	Daily Ingestion Rate (kg/day dw)	Sediment Ingestion Rate (kg/day dw)	Daily Dietary Dose (mg/kg/d)	TRV (mg/kg/d)		HQ	
									NOAEL	LOAEL	NOAEL	LOAEL
Semivolatile Organic Compounds (SVOCs)												
Acenaphthylene	0.0558	0.8961	100%	(0.0182*[Cs]*flipid) / foc	0.005	0.045	0.0009	0.00031	65.6	656	0.000005	0.000000
Anthracene	0.0532	0.8961	100%	(0.00991*[Cs]*flipid) / foc	0.003	0.045	0.0009	0.00019	65.6	656	0.000003	0.000000
Benzo(a)anthracene	0.104	0.8961	100%	(0.0135*[Cs]*flipid) / foc	0.007	0.045	0.0009	0.00046	0.615	6	0.000748	0.000075
Benzo(a)pyrene	0.111	0.8961	100%	(0.0021*[Cs]*flipid) / foc	0.001	0.045	0.0009	0.00017	0.615	6	0.000277	0.000028
Benzo(b)fluoranthene	0.0758	0.8961	100%	(0.00246*[Cs]*flipid) / foc	0.001	0.045	0.0009	0.00012	0.615	6	0.000201	0.000020
Benzo(g,h,i)perylene	0.0677	0.8961	100%	(0.025*[Cs]*flipid) / foc	0.008	0.045	0.0009	0.00050	0.615	6	0.000805	0.000081
Benzo(k)fluoranthene	0.169	0.8961	100%	(0.0023*[Cs]*flipid) / foc	0.002	0.045	0.0009	0.00027	0.615	6	0.000436	0.000044
Chrysene	0.203	0.8961	100%	(0.01*[Cs]*flipid) / foc	0.010	0.045	0.0009	0.00072	0.615	6	0.001	0.000116
Dibenzo(a,h)anthracene	0.00662	0.8961	100%	(0.00215*[Cs]*flipid) / foc	0.0001	0.045	0.0009	0.00001	0.615	6	0.000017	0.000002
Fluoranthene	0.255	0.8961	100%	(0.0075*[Cs]*flipid) / foc	0.010	0.045	0.0009	0.00074	0.615	6	0.001	0.000120
Indeno(1,2,3-cd)pyrene	0.0336	0.8961	100%	(0.0144*[Cs]*flipid) / foc	0.002	0.045	0.0009	0.00016	0.615	6	0.000253	0.000025
Pyrene	0.342	0.8961	100%	(0.0126*[Cs]*flipid) / foc	0.022	0.045	0.0009	0.00143	0.615	6	0.002	0.000233
Polychlorinated biphenyls												
Total PCBs	0.0531	0.8961	100%	2.16	0.115	0.045	0.0009	0.00583	0.004	0.04	1	0.1
Metals												
Arsenic	47.13	0.8961	100%	e^(0.706*LN(Cs)-1.421)	11.3	0.045	0.0009	0.62	1.04	1.66	0.6	0.4
Cadmium	4.9	0.8961	100%	e^(0.795*LN(Cs)+2.114)	16.9	0.045	0.0009	0.85	0.77	7.70	1	0.1
Chromium	24.36	0.8961	100%	0.306*(Cs)	7.5	0.045	0.0009	0.40	2.4	24.00	0.2	0.02
Copper	59.73	0.8961	100%	0.515*(Cs)	30.8	0.045	0.0009	1.61	5.6	9.34	0.3	0.2
Lead	122.7	0.8961	100%	e^(0.807 * LN(Cs) - 0.218)	40.6	0.045	0.0009	2.17	4.7	8.90	0.5	0.2
Nickel	43.74	0.8961	100%	e^(7.033-1.548*LN(Cs))	56.9	0.045	0.0009	2.91	1.7	3.40	**2**	0.9
Zinc	257.1	0.8961	100%	e^(0.328 * LN(Cs) + 4.449)	874.1	0.045	0.0009	44.32	75.4	754.00	0.6	0.06

Notes:
BSAF = Biota-sediment accumulation factor
Cfish = Concentration in fish
COPEC = Constituent of potential ecological concern
Cs = Concentration in soil/sediment
EPC = Exposure point concentration
HQ = Hazard quotient
kg = Kilogram
kg/day dw = Kilograms per day dry weight
LOAEL = Lowest observed adverse effects level
mg/kg = Milligrams per kilogram
mg/kg/d = Milligrams per kilogram per day
NA = Not applicable, not a COPEC in this medium
NOAEL = No observed adverse effects level
TRV = Toxicity reference value
foc = fraction organic carbon; conservatively assumed to be 1% per Long and Morgan 1991

BSAFs sourced from:
SVOCs: USEPA BSAF database; value is the mean value for each individual PAH across various freshwater sites for whole body fish tissue data.
Metals: Bechtel Jacobs 1998.
PCBs: Kay et al 2005

Table 7
Hazard Quotients for Great Blue Heron Based on Estimated Tissue Concentrations in Food
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

COPEC	Sediment EPC (mg/kg)	Body Weight (kg)	Dietary Composition Fish	$BSAF_{fish}$	C_{fish} (mg/kg)	Daily Ingestion Rate (kg/day dw)	Sediment Ingestion Rate (kg/day dw)	Daily Dietary Dose (mg/kg/d)	TRV (mg/kg/d)		HQ	
									NOAEL	LOAEL	NOAEL	LOAEL
Semivolatile Organic Compounds (SVOCs)												
Acenaphthylene	0.0558	2.34	100%	(0.0182*[Cs]*flipid) / foc	0.005	0.13	0.0027	0.00036	1653	16530	0.000000	0.000000
Anthracene	0.0532	2.34	100%	(0.00991*[Cs]*flipid) / foc	0.003	0.13	0.0027	0.00021	1653	16530	0.000000	0.000000
Benzo(a)anthracene	0.104	2.34	100%	(0.0135*[Cs]*flipid) / foc	0.007	0.13	0.0027	0.00053	2	20	0.000263	0.000026
Benzo(a)pyrene	0.111	2.34	100%	(0.0021*[Cs]*flipid) / foc	0.001	0.13	0.0027	0.00020	2	20	0.000098	0.000010
Benzo(b)fluoranthene	0.0758	2.34	100%	(0.00246*[Cs]*flipid) / foc	0.001	0.13	0.0027	0.00014	2	20	0.000071	0.000007
Benzo(g,h,i)perylene	0.0677	2.34	100%	(0.025*[Cs]*flipid) / foc	0.008	0.13	0.0027	0.00057	2	20	0.000283	0.000028
Benzo(k)fluoranthene	0.169	2.34	100%	(0.0023*[Cs]*flipid) / foc	0.002	0.13	0.0027	0.00031	2	20	0.000153	0.000015
Chrysene	0.203	2.34	100%	(0.01*[Cs]*flipid) / foc	0.010	0.13	0.0027	0.00082	2	20	0.000409	0.000041
Dibenzo(a,h)anthracene	0.00662	2.34	100%	(0.00215*[Cs]*flipid) / foc	0.0001	0.13	0.0027	0.00001	2	20	0.000006	0.000001
Fluoranthene	0.255	2.34	100%	(0.0075*[Cs]*flipid) / foc	0.010	0.13	0.0027	0.00084	2	20	0.000422	0.000042
Indeno(1,2,3-cd)pyrene	0.0336	2.34	100%	(0.0144*[Cs]*flipid) / foc	0.002	0.13	0.0027	0.00018	2	20	0.000089	0.000009
Pyrene	0.342	2.34	100%	(0.0126*[Cs]*flipid) / foc	0.022	0.13	0.0027	0.00164	2	20	0.000818	0.000082
Polychlorinated biphenyls												
Total PCBs	0.0531	2.34	100%	2.16	0.115	0.13	0.0027	0.00667	1.8	7.1	0.00082	8.2E-05
Metals												
Arsenic	47.13	2.34	100%	e^(0.706*LN(Cs)-1.421)	11.3	0.13	0.0027	0.71	2.24	22.4	0.3	0.03
Cadmium	4.9	2.34	100%	e^(0.795*LN(Cs)+2.114)	16.9	0.13	0.0027	0.98	1.47	14.7	0.7	0.07
Chromium	24.36	2.34	100%	0.306*(Cs)	7.5	0.13	0.0027	0.46	2.66	26.6	0.2	0.02
Copper	59.73	2.34	100%	0.515*(Cs)	30.8	0.13	0.0027	1.84	4.05	12.1	0.5	0.2
Lead	122.7	2.34	100%	e^(0.807 * LN(Cs) - 0.218)	40.6	0.13	0.0027	2.48	1.63	3.26	**2**	0.8
Nickel	43.74	2.34	100%	e^(7.033-1.548*LN(Cs))	56.9	0.13	0.0027	3.33	6.71	67.1	0.5	0.05
Zinc	257.1	2.34	100%	e^(0.328 * LN(Cs) + 4.449)	874.1	0.13	0.0027	50.65	66.1	661	0.8	0.08

Notes:

BSAF = Biota-sediment accumulation factor
Cfish = Concentration in fish
COPEC = Constituent of potential ecological concern
Cs = Concentration in soil/sediment
EPC = Exposure point concentration
HQ = Hazard quotient
kg = Kilogram
kg/day dw = Kilograms per day dry weight
LOAEL = Lowest observed adverse effects level
mg/kg = Milligrams per kilogram
mg/kg/d = Milligrams per kilogram per day
NA = Not applicable, not a COPEC in this medium
NOAEL = No observed adverse effects level
TRV = Toxicity reference value
foc = fraction organic carbon; conservatively assumed to be 1% per Long and Morgan 1991

SVOCs: USEPA BSAF database; value is the mean value for each individual PAH across various freshwater sites for whole body fish tissue data.
Metals: Bechtel Jacobs 1998.
PCBs: Kay et al 2005

Table 8
Hazard Quotients Based on Sediment
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

COPEC	HQ Based on Site-specific Sediment Samples					
	Tree Swallow		Great Blue Heron		Mink	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Semivolatile Organic Compounds (SVOCs)						
Acenaphthylene	0.000041	0.000004	0.0000002	0.00000002	0.000005	0.0000005
Anthracene	0.000028	0.000003	0.0000001	0.00000001	0.000003	0.0000003
Benzo(a)anthracene	0.06	0.006	0.000263	0.000026	0.000748	0.000075
Benzo(a)pyrene	0.03	0.003	0.000098	0.000010	0.000277	0.000028
Benzo(b)fluoranthene	0.01	0.001	0.000071	0.000007	0.000201	0.000020
Benzo(g,h,i)perylene	0.004	0.000435	0.000283	0.000028	0.000805	0.000081
Benzo(k)fluoranthene	0.2	0.02	0.000153	0.000015	0.000436	0.000044
Chrysene	0.07	0.007	0.000409	0.000041	0.001	0.000116
Dibenzo(a,h)anthracene	0.000882	0.000088	0.000006	0.000001	0.000017	0.000002
Fluoranthene	0.3	0.03	0.000422	0.000042	0.001	0.000120
Indeno(1,2,3-cd)pyrene	0.004	0.000370	0.000089	0.000009	0.000253	0.000025
Pyrene	0.2	0.02	0.000818	0.000082	0.002	0.000233
Polychlorinated biphenyls						
Total PCBs	0.009	0.002	0.000818	0.000082	1	0.1
Metals						
Arsenic	1	0.1	0.6	0.4	0.3	0.03
Cadmium	**11**	1	1	0.1	0.7	0.07
Chromium	**2**	0.2	0.2	0.02	0.2	0.02
Copper	**5**	**2**	0.3	0.2	0.5	0.2
Copper (refined)	1	0.5	--	--	--	--
Lead	**15**	**7**	0.5	0.2	**2**	0.8
Lead (refined)	**3**	0.6	--	--	--	--
Nickel	0.4	0.04	**2**	0.9	0.5	0.05
Zinc	**5**	0.5	0.6	0.06	0.8	0.08

Notes:

(a) Surface soil defined as depth interval from 0 to 6 inches below ground surface

Bold cells indicate an HQ > 1

COPEC = Constituent of potential ecological concern

HQ = Hazard quotient

LOAEL = Lowest observed adverse effects level

NOAEL = No observed adverse effects level

-- = refined value not calculated

Refined values calculated using TRV's detailed in Section 6 and Appendix F of the Ecological Assessment

Table 9
Summary of Surface Water Hazard Quotients Using Maximum Detected Concentration of Site-wide Data Set
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Chemical	Ecologically Based Screening Levels (EBSLs)		SW COPEC? COPEC Detected in GW and SW > SL	Detection Frequency	Maximum Detect	Hazard Quotient
	Chronic	Notes				
Metals - Total						
Aluminum	87	(i)	Yes	12/14	600	7
Barium	220	(c)	Yes	14/14	270	1
Copper	5.56	(a)	Yes	6/14	6.1	1
Manganese	120	(i)	Yes	19/19	1800	15
Metals - Dissolved						
Manganese	120	(i)	Yes	14/14	1500	13

General Notes:

Results are reported in micrograms per liter (ug/L).

Footnotes:

(a) = Criteria can be calculated following formula f3 of NJAC 7:9B for total metals.

(c) = U.S. Environmental Protection Agency (USEPA) Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.

(i) = Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (USEPA 2006)

Acronyms and Abbreviations:

COPEC = constituents of potential ecological concern
GW = groundwater
USEPA = United States Environmental Protection Agency
SL = screening level
SW = surface water

Table 10
Refined Surface Water Hazard Quotients Using 95% UCL or Maximum of Site-wide Data Set
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Chemical	Ecologically Based Screening Levels (EBSLs)		SW COPEC? COPEC Detected in GW and SW > SL	Detection Frequency	Maximum Detect	Hazard Quotient	95% UCL	Hazard Quotient of 95% UCL	Refined Hazard Quotient (95% UCL if available, if not Maximum)
	Chronic	Notes							
Metals - Total									
Aluminum	87	(i)	Yes	12/14	600	7	274	3	3
Barium	220	(c)	Yes	14/14	270	1	130	0.6	0.6
Copper	5.56	(a)	Yes	6/14	6.1	1	3	0.5	0.5
Manganese	120	(i)	Yes	19/19	1800	15	788	7	7
Metals - Dissolved									
Manganese	120	(i)	Yes	14/14	1500	13	741	6	6

General Notes:

Results are reported in micrograms per liter (ug/L).

Footnotes:

(a) = Criteria can be calculated following formula f3 of NJAC 7:9B for total metals.
(c) = U.S. Environmental Protection Agency (USEPA) Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.
(i) = Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (USEPA 2006)

Acronyms and Abbreviations:

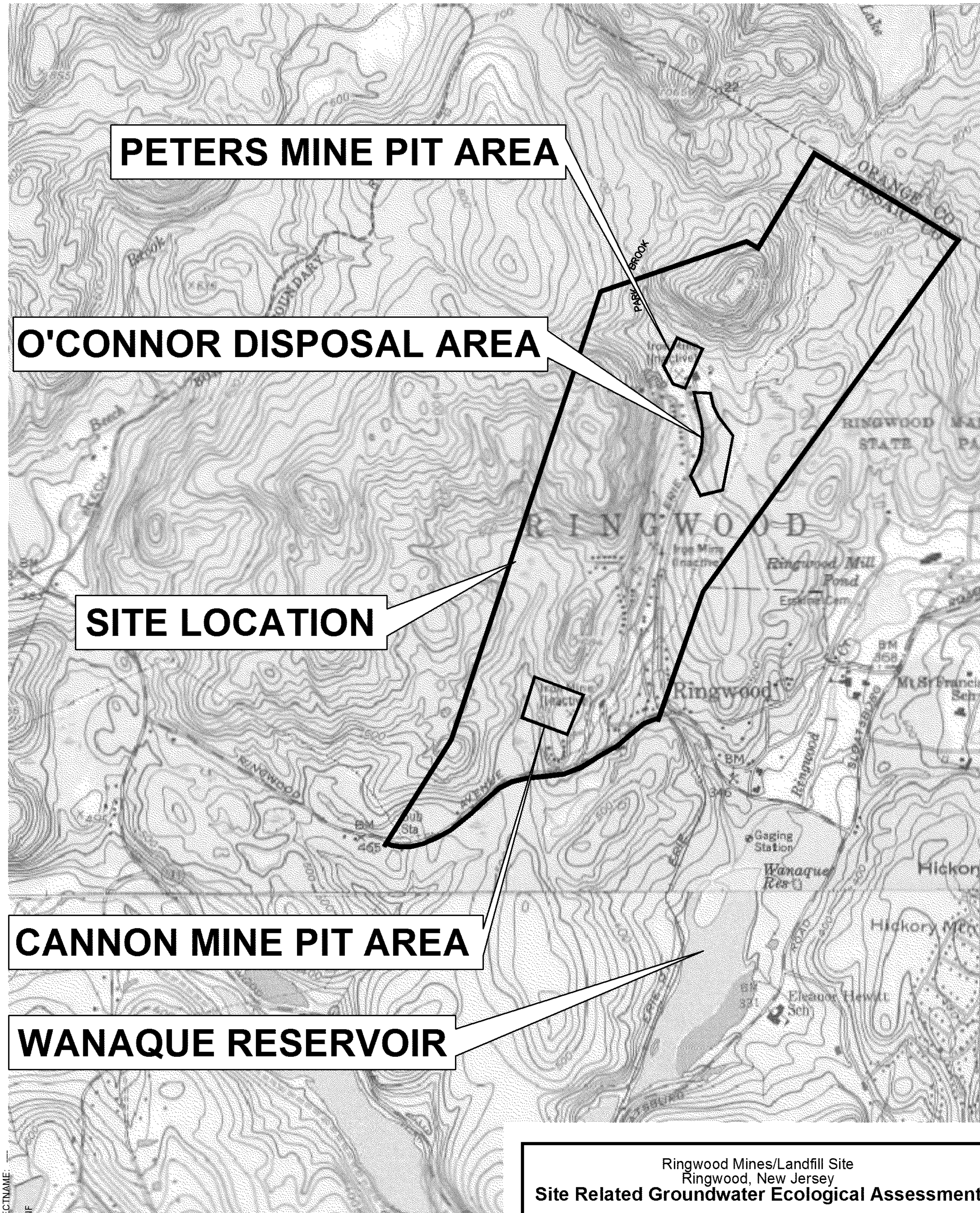
95% UCL = 95 percent upper confidence limit on the mean
COPEC = constituents of potential ecological concern
GW = groundwater
USEPA = United States Environmental Protection Agency
SL = screening level
SW = surface water

Table 11
Refined Sediment Hazard Quotients Using 95% of Maximum of Site-wide Data Set
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Constituent	Sediment EBSL		Frequency of Detection	Exposure Point Concentration		Hazard Quotient of Maximum	Refined Hazard Quotient (95 UCL if available, if not Maximum)
	SEL	Notes		Max	95 UCL		
Volatile Organic Compounds (VOCs)							
2-Butanone	0.0424	(a)	1/13	0.13	NA	3	**3**
Acenaphthylene	--	--	1/13	0.06	NA	NA	NA
Acetone	0.0099	(a)	5/13	0.28	0.0811	28	**8**
Anthracene	3.7	(c)	1/13	0.05	NA	0.01	0.01
Benzo(a)anthracene	14.8	(c)	7/13	0.21	0.104	0.01	0.007
Benzo(a)pyrene	14.4	(c)	6/13	0.23	0.111	0.02	0.008
Benzo(b)fluoranthene	--	--	7/13	0.16	0.0758	NA	NA
Benzo(g,h,i)perylene	3.2	(c)	6/13	0.12	0.0677	0.04	0.02
Benzo(k)fluoranthene	13.4	(c)	2/13	0.17	NA	0.01	0.01
Chrysene	4.6	(c)	8/13	0.29	0.203	0.06	0.04
Dibenzo(a,h)anthracene	1.3	(c)	2/13	0.01	NA	0.005	0.005
Fluoranthene	10.2	(c)	8/13	0.36	0.255	0.04	0.03
Indeno(1,2,3-cd)pyrene	3.2	(c)	6/13	0.10	0.0336	0.03	0.01
Methyl acetate	--	--	6/13	0.17	0.0607	NA	NA
Pyrene	8.5	(c)	8/13	0.53	0.342	0.06	0.04
Semivolatile Organic Compounds (SVOCs)							
Acenaphthylene	0.044	(b, f)	1/13	0.06	NA	1	1
Benzaldehyde	--	--	1/13	0.09	NA	NA	NA
bis(2-Ethylhexyl)phthalate	0.75	(c)	4/13	0.37	NA	0.5	0.5
Pyrene	850	--	8/13	0.53	0.342	0.0006	0.0004
Polychlorinated Biphenyls (PCBs)							
Aroclor-1242	0.34	(e)	1/13	0.008	NA	0.02	0.02
Aroclor-1260	0.34	(e)	4/13	0.020	NA	0.06	0.06
Metals							
Aluminum	25500	(c, f)	13/13	30000	17092	1	0.7
Antimony	3	(c)	1/13	4.1	NA	1	1
Arsenic	33	(c)	13/13	72	47.13	2	1
Beryllium	--	--	2/13	0.93	NA	NA	NA
Cadmium	10	(c)	2/13	4.9	NA	0.5	0.5
Chromium	110	(c)	13/13	52	24.36	0.5	0.2
Copper	110	(c)	13/13	141	59.73	1	0.5
Lead	250	(c)	13/13	384	122.7	2	0.5
Manganese	1100	(c)	13/13	3170	1468	3	1
Mercury	2	(c)	9/13	0.50	0.194	0.3	0.10
Nickel	75	(c)	12/13	83	43.74	1	0.6
Vanadium	57	(b)	13/13	163	93.52	3	**2**
Zinc	820	(c)	13/13	561	257.1	0.7	0.3

Notes:
Results are reported in milligrams per kilogram (mg/kg)
Bolded values indicate a hazard quotient based on the 95 UCL that is greater than 1.
LEL = Lowest Effects Level
SEL = Severe Effects Level
95 UCL = 95th percentile upper confidence limit of the mean
(a) = Resource Conservation and Recovery Act Region 5 Ecological Screening Level (United States Environmental Protection Agency 2003)
(b) = Screening values were developed for the protection of marine receptors; however they are considered surrogates for fresh water
(c) = Sediment value from the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs)
(e) PCB LEL from MacDondald et. al. 2000
(f) = LEL for aluminum used for lack of an SEL

FIGURES



REFERENCE: WANAQUE, NJ AND GREENWOOD LAKE, NY–NJ, USGS QUADRANGLE, 7.5 MINUTE SERIES, 1995 AND 1954.

0 2000
SCALE IN FEET

LEGEND:

SITE BOUNDARY

Ringwood Mines/Landfill Site
Ringwood, New Jersey
Site Related Groundwater Ecological Assessment

SITE LOCATION

ARCADIS

FIGURE
1

CITY:MAHWAH DIV/GROUP:ENVCAD DB:JG LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Fairlawn\ACT - 2015\NJ000604\2014\00008\2015-03\FIG-01 - SITE LOCATION MAP.dwg LAYOUT: 1 SAVED: 9/2/2015 1:30 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 9/2/2015 1:31 PM BY: GONZALEZ, JAMES
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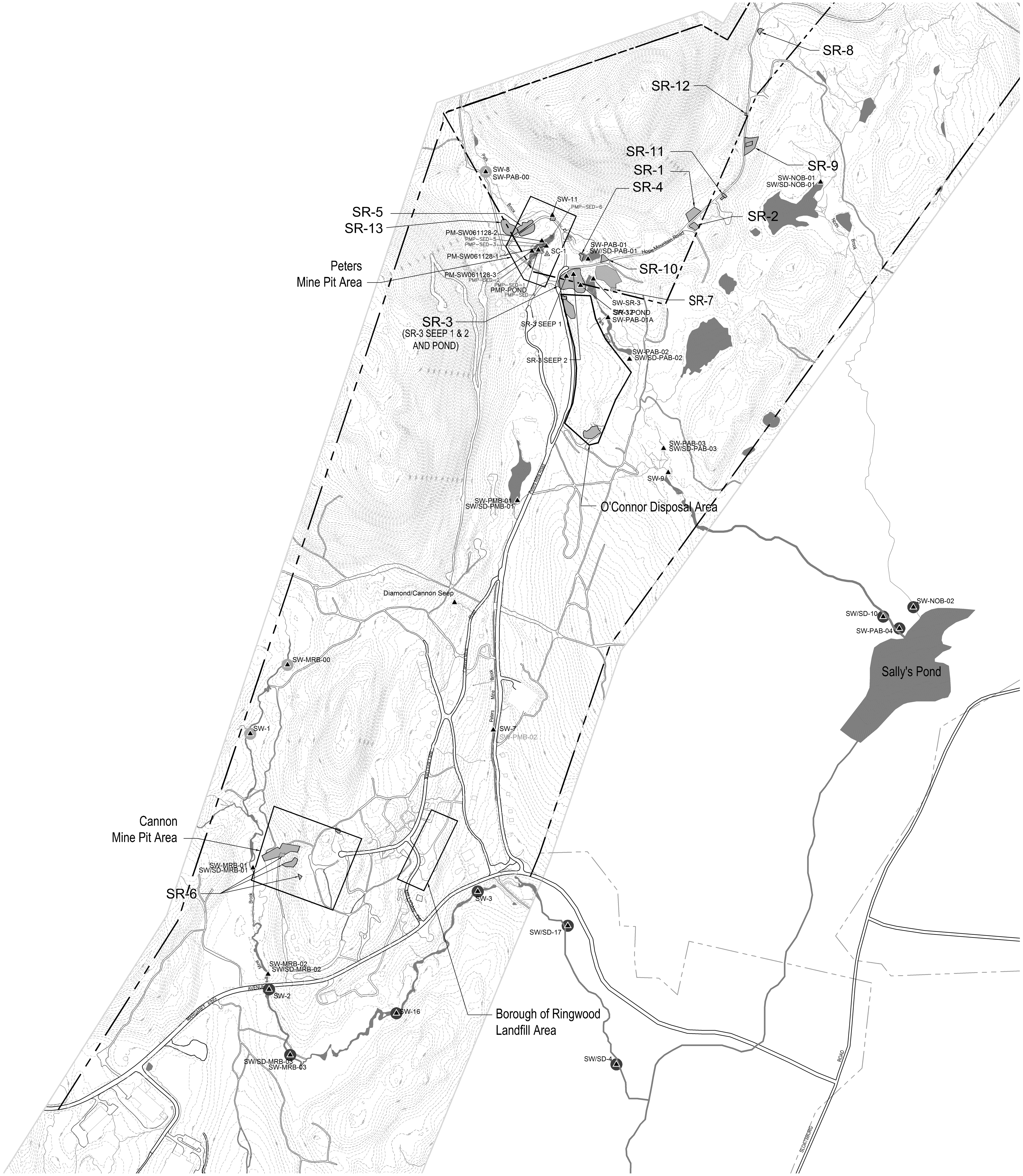


LEGEND

- DIRECTIONAL WELL
- PAINT SLUDGE REMOVAL AREA
- SW-2 — SURFACE WATER AND SEDIMENT – SAMPLE LOCATION
- SW-MRB-01 — SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM MINE BROOK
- SW-NOB-01 — SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM NORTH BROOK
- SW-PAB-01 — SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM PARK BROOK
- PMP–SED–1 — PROPOSED SEDIMENT SAMPLING LOCATION
- SW-PMB-02 — CADMIUM CONCENTRATION EXCEEDED NJDEP SURFACE WATER QUALITY CRITERIA
- TRAIL/ DIRT ROAD
- WATER BODY
- STREAM
- INFERRED STREAM
- BACKGROUND SURFACE WATER AND SEDIMENT SAMPLING LOCATION
- OFF–SITE SURFACE WATER AND SEDIMENT SAMPLING LOCATION

NOTES:

1. WHEN A DUPLICATE SAMPLE ANALYSIS WAS PERFORMED, EXISTING CONTOURS DEPICT TOPOGRAPHY PRIOR TO REMOVAL ACTIVITIES.
2. SURFACE WATER SAMPLES ONLY COLLECTED AT SEEP SAMPLING LOCATIONS; NO SEDIMENT SAMPLES COLLECTED.

0 300' 600'
GRAPHIC SCALE

Ringwood Mines/Landfill Site
Ringwood, New Jersey
SITE RELATED GROUNDWATER ECOLOGICAL ASSESSMENT

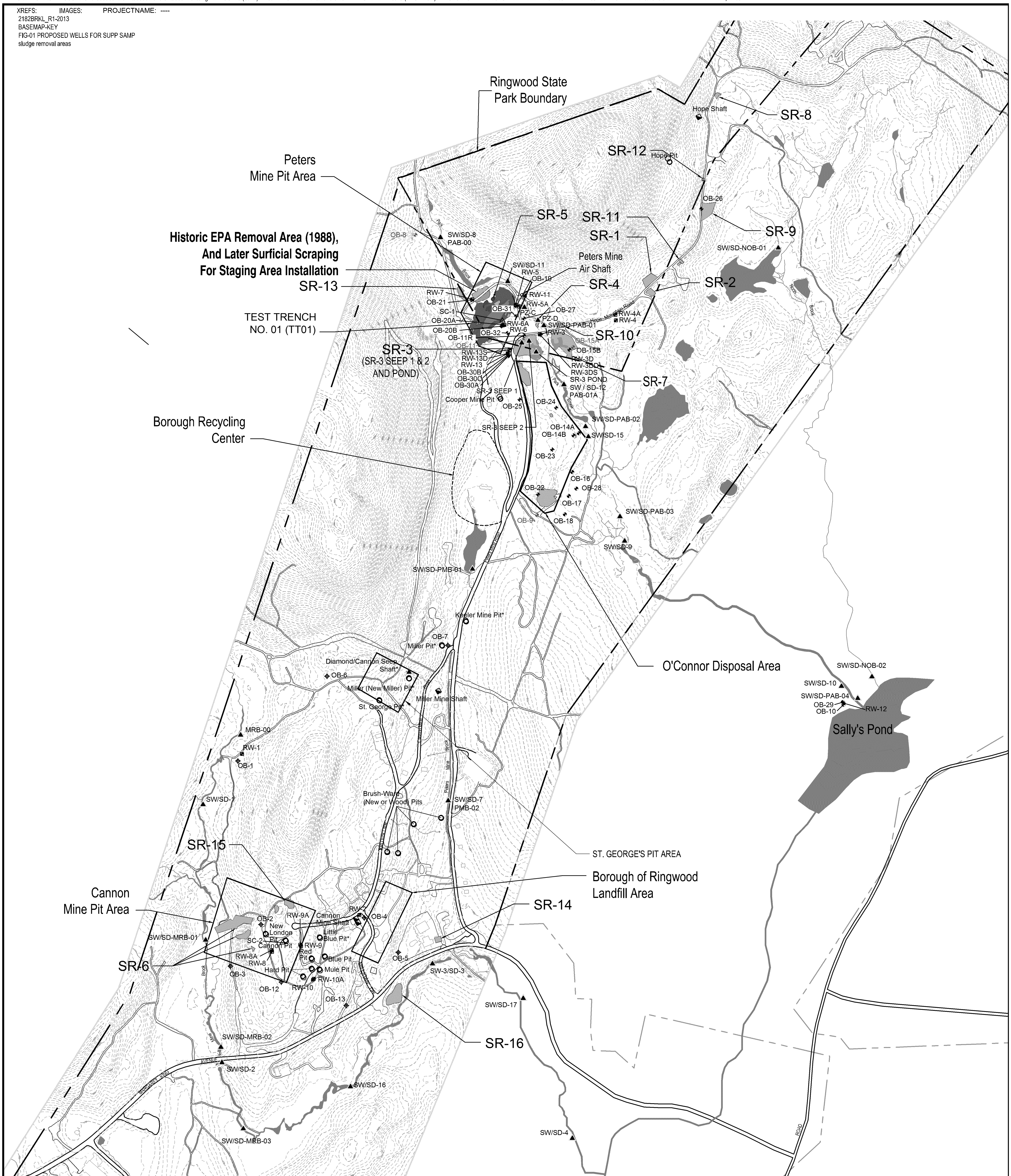
SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\NJ000604\2014\00008\2016-04\00604B02.dwg LAYOUT: 3 (SITE) ANSI PD SAVED: 4/15/2016 3:20 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS-MAHWAH.CTB PLOTTED: 4/15/2016 3:21 PM BY: KRAHMER, ERIC

XREFS: IMAGES: PROJECTNAME: ----
2182BRKL_R1-2013
BASEMAP-KEY
FIG-01 PROPOSED WELLS FOR SUPP SAMP
sludge removal areas



LEGEND

- BEDROCK WELL
- DEEP BEDROCK WELL
- DIRECTIONAL WELL
- UNCONSOLIDATED WELL
- MONITORING WELL DAMAGED OR NOT AVAILABLE FOR SAMPLING
- APPROXIMATE LIMITS OF REMOVAL AREAS – SOIL, PAINT SLUDGE, AND DRUM REMNANTS
- APPROXIMATE LIMITS OF REMOVAL AREA – SOIL AND DRUM REMNANTS
- APPROXIMATE LIMITS OF REMOVAL AREA – SOIL, DRUMS, AND DRUM REMNANTS
- APPROXIMATE LIMITS OF REMOVAL AREA – SOIL AND PAINT SLUDGE
- APPROXIMATE LIMITS OF SURFICIAL SOIL SCRAPING
- HISTORICAL FILL AREA SURROUNDING PETERS MINE PIT (AREA 1)
- INDICATES VERNAL CONDITIONS TYPICALLY OBSERVED IN THE SPRING AND FALL SEASONS
- WATER BODY
- SW/SD-2 SURFACE WATER AND SEDIMENT – SAMPLE LOCATION
- SW/SD-MRB-01 SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM MINE BROOK
- SW/SD-PMB-01 SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM PETERS MINE BROOK
- SW/SD-NOB-01 SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM NORTH BROOK
- SW/SD-PAB-01 SURFACE WATER AND SEDIMENT – SAMPLE LOCATION FROM PARK BROOK
- TRAIL/ DIRT ROAD
- STREAM
- INFERRED STREAM
- TOP OF SLOPE TO MINE PIT WITHIN PETERS MINE PIT, ELEVATION 525 FT MSL (1961)
- TOP OF BEDROCK PIT WITHIN PETERS MINE PIT

NOTE:
EXISTING CONTOURS DEPICT TOPOGRAPHY PRIOR TO REMOVAL ACTIVITIES.

0 400' 800'
GRAPHIC SCALE

Revisions		
No.	Date	By
1	2/27/2014	P. Macchiaroli
2	11/24/2014	M. Kleczkowski

Ringwood Mines/Landfill Site
Ringwood, New Jersey
Site Related Groundwater Ecological Assessment

MONITORING WELL LOCATIONS

ARCADIS

FIGURE
3

APPENDIX A

2014 – 2016 Groundwater Analytical Results

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		CM SHAFT	CM SHAFT	CM SHAFT	CM SHAFT	OB-02	OB-02	OB-03	OB-03
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41894.00	41900.00	41900.00	41901.00	41897.00	42228.00	41890.00	41890.00
Sample Name:	Units	Chronic	Note	CM-50(091214)	CM-100(091814)	CM-160(091814)	CM-275(091914)	OB-2(091514)	OB-2-081215	DUP(090814)	OB-3(090814)
PCBs											
Aroclor-1016	ug/L	--		NA	NA	NA	NA	NA	<0.43	NA	NA
Aroclor-1221	ug/L	--		NA	NA	NA	NA	NA	<0.34	NA	NA
Aroclor-1232	ug/L	--		NA	NA	NA	NA	NA	<0.4	NA	NA
Aroclor-1242	ug/L	--		NA	NA	NA	NA	NA	<0.22	NA	NA
Aroclor-1248	ug/L	--		NA	NA	NA	NA	NA	<0.15	NA	NA
Aroclor-1254	ug/L	--		NA	NA	NA	NA	NA	<0.17	NA	NA
Aroclor-1260	ug/L	--		NA	NA	NA	NA	NA	<0.18	NA	NA
Total PCBs	ug/L	--		NA	NA	NA	NA	NA	<0.43	NA	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	NA	NA	NA	NA	<0.19	NA	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	NA	NA	NA	NA	<0.19	NA	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	NA	NA	NA	NA	<0.15	NA	NA
1,1,2-Trichloroethane	ug/L	500	(c)	NA	NA	NA	NA	NA	<0.19	NA	NA
1,1-Dichloroethane	ug/L	--		NA	NA	NA	NA	NA	<0.24	NA	NA
1,1-Dichloroethene	ug/L	65	(c)	NA	NA	NA	NA	NA	<0.25	NA	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	NA	NA	NA	<2.1	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	NA	NA	NA	NA	<0.01	NA	NA
1,2-Dibromoethane	ug/L	--		NA	NA	NA	NA	NA	<0.01	NA	NA
1,2-Dichlorobenzene	ug/L	14	(c)	NA	NA	NA	NA	NA	<0.19	NA	NA
1,2-Dichloroethane	ug/L	910	(c)	NA	NA	NA	NA	NA	<0.2	NA	NA
1,2-Dichloropropane	ug/L	360	(c)	NA	NA	NA	NA	NA	<0.25	NA	NA
1,3-Dichlorobenzene	ug/L	38	(c)	NA	NA	NA	NA	NA	<0.18	NA	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	NA	NA	NA	NA	<0.17	NA	NA
2-Butanone	ug/L	--		NA	NA	NA	NA	NA	<2.6	NA	NA
2-Hexanone	ug/L	--		NA	NA	NA	NA	NA	<1.3	NA	NA
4-Methyl-2-pentanone	ug/L	--		NA	NA	NA	NA	NA	<0.81	NA	NA
Acetone	ug/L	--		NA	NA	NA	NA	NA	<2.7	NA	NA
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	NA	NA	NA	NA	<0.17	NA	NA
Bromoform	ug/L	230	(c)	NA	NA	NA	NA	NA	<0.29	NA	NA
Bromomethane	ug/L	16	(c)	NA	NA	NA	NA	NA	<0.35	NA	NA
Carbon Disulfide	ug/L	--		NA	NA	NA	NA	NA	<0.22	NA	NA
Carbon Tetrachloride	ug/L	240	(c)	NA	NA	NA	NA	NA	<0.18	NA	NA
Chlorobenzene	ug/L	47	(c)	NA	NA	NA	NA	NA	<0.18	NA	NA
Chloroethane	ug/L	--		NA	NA	NA	NA	NA	<0.36	NA	NA
Chloroform	ug/L	140	(c)	NA	NA	NA	NA	NA	<0.23	NA	NA
Chloromethane	ug/L	--		NA	NA	NA	NA	NA	<0.36	NA	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	NA	NA	NA	NA	<0.21	NA	NA
cis-1,3-Dichloropropene	ug/L	--		NA	NA	NA	NA	NA	<0.17	NA	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	NA	NA	NA	NA	<0.25	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	CM SHAFT / -- / 41894.00 / CM-50(091214)	CM SHAFT / -- / 41900.00 / CM-100(091814)	CM SHAFT / -- / 41900.00 / CM-160(091814)	CM SHAFT / -- / 41901.00 / CM-275(091914)	OB-02 / -- / 41897.00 / OB-2(091514)	OB-02 / -- / 42228.00 / OB-2-081215	OB-03 / -- / 41890.00 / DUP(090814)	OB-03 / -- / 41890.00 / OB-3(090814)
Dichlorodifluoromethane	ug/L	--		NA	NA	NA	NA	NA	<0.17	NA	NA
Isopropylbenzene	ug/L	--		NA	NA	NA	NA	NA	<0.33	NA	NA
Methyl acetate	ug/L	--		NA	NA	NA	NA	NA	<0.58	NA	NA
Methylcyclohexane	ug/L	--		NA	NA	NA	NA	NA	<0.09	NA	NA
Methylene Chloride	ug/L	940	(c)	NA	NA	NA	NA	NA	<0.22 B	NA	NA
Styrene	ug/L	32	(c)	NA	NA	NA	NA	NA	<0.28	NA	NA
Tetrachloroethene	ug/L	45	(c)	NA	NA	NA	NA	NA	<0.14	NA	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	NA	NA	NA	NA	<0.23	NA	NA
trans-1,3-Dichloropropene	ug/L	--		NA	NA	NA	NA	NA	<0.17	NA	NA
Trichloroethene	ug/L	47	(c)	NA	NA	NA	NA	NA	<0.2	NA	NA
Trichlorofluoromethane	ug/L	--		NA	NA	NA	NA	NA	<0.21	NA	NA
Vinyl Chloride	ug/L	930	(c)	NA	NA	NA	NA	NA	<0.18	NA	NA
Benzene	ug/L	114	(c)	NA	NA	NA	NA	NA	<0.2	NA	NA
Toluene	ug/L	253	(c)	NA	NA	NA	NA	NA	<0.17	NA	NA
Ethylbenzene	ug/L	14	(c)	NA	NA	NA	NA	NA	<0.19	NA	NA
Xylenes (total)	ug/L	27	(c)	NA	NA	NA	NA	NA	<0.58	NA	NA
Methyl tert-butyl ether	ug/L	51000	(f)	NA	NA	NA	NA	NA	<0.17	NA	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	NA	NA	NA	<0.01	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	<0.2	NA	NA
1,4-Dioxane	ug/L	22000	(k)	NA	NA	NA	NA	NA	<0.27	NA	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	NA	NA	NA	<2.8	NA	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	NA	NA	NA	<6.9	NA	NA
2,4,5-Trichlorophenol	ug/L	--		NA	NA	NA	NA	NA	<7.1	NA	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	NA	NA	NA	<6.8	NA	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	NA	NA	NA	<5.6	NA	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	NA	NA	NA	<4.2	NA	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	NA	NA	NA	<5.9	NA	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	NA	NA	NA	<3.2	NA	NA
2,6-Dinitrotoluene	ug/L	--		NA	NA	NA	NA	NA	<2.3	NA	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	NA	NA	NA	<2.8	NA	NA
2-Chlorophenol	ug/L	24	(c)	NA	NA	NA	NA	NA	<4.8	NA	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	NA	NA	NA	<0.4	NA	NA
2-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	<2.3	NA	NA
2-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	<3.7	NA	NA
2-Nitrophenol	ug/L	--		NA	NA	NA	NA	NA	<5.3	NA	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	NA	NA	NA	<3.3	NA	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	<2.2	NA	NA
3-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	<2.7	NA	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	NA	NA	NA	<9.3	NA	NA
4-Bromophenyl-phenylether	ug/L	--		NA	NA	NA	NA	NA	<2.7	NA	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	<4.5	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		CM SHAFT	CM SHAFT	CM SHAFT	CM SHAFT	OB-02	OB-02	OB-03	OB-03
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41894.00	41900.00	41900.00	41901.00	41897.00	42228.00	41890.00	41890.00
Sample Name:	Units	Chronic	Note	CM-50(091214)	CM-100(091814)	CM-160(091814)	CM-275(091914)	OB-2(091514)	OB-2-081215	DUP(090814)	OB-3(090814)
4-Chloroaniline	ug/L	--		NA	NA	NA	NA	NA	<4.2	NA	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	NA	NA	NA	<2.8	NA	NA
4-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	<3.1	NA	NA
4-Nitrophenol	ug/L	60	(c)	NA	NA	NA	NA	NA	<5.4	NA	NA
Acenaphthene	ug/L	38	(c)	NA	NA	NA	NA	NA	<0.32	NA	NA
Acenaphthylene	ug/L	4840	(c)	NA	NA	NA	NA	NA	<0.35	NA	NA
Acetophenone	ug/L	--		NA	NA	NA	NA	NA	<2.3	NA	NA
Anthracene	ug/L	0.035	(c)	NA	NA	NA	NA	NA	<0.38	NA	NA
Atrazine	ug/L	--		NA	NA	NA	NA	NA	<2.9	NA	NA
Benzaldehyde	ug/L	--		NA	NA	NA	NA	NA	<5.7	NA	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	NA	NA	NA	<0.025	NA	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	NA	NA	NA	<0.025	NA	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	NA	NA	NA	<0.025	NA	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	NA	NA	NA	<0.62	NA	NA
Benzo(k)fluoranthene	ug/L	--		NA	NA	NA	NA	NA	<0.37	NA	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	NA	NA	NA	<3.1	NA	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	NA	NA	NA	<2.8	NA	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	NA	NA	NA	NA	<6	NA	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	NA	NA	NA	<2.5	NA	NA
Caprolactam	ug/L	--		NA	NA	NA	NA	NA	<2.4	NA	NA
Carbazole	ug/L	--		NA	NA	NA	NA	NA	<2.8	NA	NA
Chrysene	ug/L	--		NA	NA	NA	NA	NA	<0.33	NA	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	<0.13	NA	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	NA	NA	NA	<0.45	NA	NA
Dibenzofuran	ug/L	--		NA	NA	NA	NA	NA	<2.9	NA	NA
Diethylphthalate	ug/L	110	(c)	NA	NA	NA	NA	NA	<3	NA	NA
Dimethylphthalate	ug/L	--		NA	NA	NA	NA	NA	<3.1	NA	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	NA	NA	NA	NA	<2.5	NA	NA
Di-n-Octylphthalate	ug/L	--		NA	NA	NA	NA	NA	<2.5	NA	NA
Diphenyl ether	ug/L	--		NA	NA	NA	NA	NA	<2.2	NA	NA
Fluoranthene	ug/L	1.9	(c)	NA	NA	NA	NA	NA	<0.32	NA	NA
Fluorene	ug/L	19	(c)	NA	NA	NA	NA	NA	<0.32	NA	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	NA	NA	NA	<0.014	NA	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	NA	NA	NA	<0.2	NA	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	NA	NA	NA	<1.8	NA	NA
Hexachloroethane	ug/L	8	(c)	NA	NA	NA	NA	NA	<1.9	NA	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	NA	NA	NA	<0.41	NA	NA
Isophorone	ug/L	920	(c)	NA	NA	NA	NA	NA	<3.1	NA	NA
Naphthalene	ug/L	13	(c)	NA	NA	NA	NA	NA	<0.37	NA	NA
Nitrobenzene	ug/L	220	(c)	NA	NA	NA	NA	NA	<2.7	NA	NA
N-Nitrosodimethylamine	ug/L	--		NA	NA	NA	NA	NA	<0.2	NA	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	NA	NA	NA	<3.4	NA	NA
N-Nitrosodiphenylamine	ug/L	--		NA	NA	NA	NA	NA	<3.6	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
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Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	CM SHAFT / -- / 41894.00 / CM-50(091214)	CM SHAFT / -- / 41900.00 / CM-100(091814)	CM SHAFT / -- / 41900.00 / CM-160(091814)	CM SHAFT / -- / 41901.00 / CM-275(091914)	OB-02 / -- / 41897.00 / OB-2(091514)	OB-02 / -- / 42228.00 / OB-2-081215	OB-03 / -- / 41890.00 / DUP(090814)	OB-03 / -- / 41890.00 / OB-3(090814)
Pentachlorophenol	ug/L	--		NA	NA	NA	NA	NA	<0.1	NA	NA
Phenanthrene	ug/L	3.6	(c)	NA	NA	NA	NA	NA	<0.42	NA	NA
Phenol	ug/L	180	(c)	NA	NA	NA	NA	NA	<1.5	NA	NA
Pyrene	ug/L	0.3	(c)	NA	NA	NA	NA	NA	<0.35	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	55.6	72.2	123	43.8	46.0 B	NA	NA
Antimony	ug/L	80	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	NA	<1.20 B	NA	NA
Barium	ug/L	220	(c)	108	118	117	117	6.40	5.20	3.30	4.20
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	NA	1.60	4.50	13.7	NA	<0.400	NA	NA
Calcium	ug/L	--	(j)	67,400	72,900	75,500	75,300	19,300	12,100	18,000	19,600
Chromium	ug/L	42	(c)	NA	7.30	27.6	52.0	NA	<0.500	NA	NA
Cobalt	ug/L	24	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Copper	ug/L	5.56	(a)	NA	6.70	21.4	94.7	2.60	2.00	1.70	1.70
Iron	ug/L	--	(j)	26,400	25,800	26,700	25,500	61.3	120	2,510	3,550
Lead	ug/L	5.4	(d) (e)	NA	2.40	13.2	104	NA	<0.200	NA	NA
Magnesium	ug/L	--	(j)	21,200	20,700	20,500	19,900	6,010	4,500	5,120	5,440
Manganese	ug/L	120	(i)	1,320	1,390	1,340	1,310	3.10	5.40	97.9	71.9
Mercury	ug/L	0.77	(d) (e)	NA	0.0750	NA	NA	NA	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	NA	2.40	3.40	11.5	NA	0.700 J	0.900	NA
Potassium	ug/L	--	(j)	2,660	4,020	4,190	4,520	1,510	1,200	1,040	1,050
Selenium	ug/L	5	(d)	5.90	NA	NA	7.20	NA	<0.600	NA	NA
Silver	ug/L	0.12	(c)	5.90	3.80	2.80	3.20	NA	<0.500	NA	NA
Sodium	ug/L	--	(j)	106,000	101,000	84,000	77,000	4,210	3,600	3,380	3,440
Thallium	ug/L	10	(c)	NA	1.90	NA	NA	NA	<0.200	NA	NA
Vanadium	ug/L	12	(c)	NA	2.70	2.30	2.80	NA	<1.50 B	NA	NA
Zinc	ug/L	71.69	(a)	4,760	8,350	11,700	14,500	NA	<10.0	NA	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	41.1	34.1	38.7	NA	<9.60	NA	NA
Antimony	ug/L	80	(c)	NA	NA	NA	NA	NA	0.640 J	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	NA	<0.500	NA	NA
Barium	ug/L	220	(c)	80.8	73.0	78.7	92.6	6.40	5.40	3.60	3.30
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	NA	<0.400	NA	NA
Calcium	ug/L	--	(j)	68,800	62,200	74,100	75,600	18,900	12,800	18,000	18,900
Chromium	ug/L	42	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Cobalt	ug/L	24	(c)	NA	NA	NA	NA	NA	<0.500	NA	NA
Copper	ug/L	5.56	(a)	NA	NA	1.30	2.90	2.70	1.30 J	1.60	NA
Iron	ug/L	--	(j)	5,160	6,010	8,660	18,200	20.4	<10.0	50.3	28.9
Lead	ug/L	5.4	(d) (e)	NA	NA	NA	NA	NA	<0.200	NA	NA
Magnesium	ug/L	--	(j)	21,600	17,800	20,600	20,300	5,910	4,600	5,110	5,250
Manganese	ug/L	120	(i)	1,330	1,170	1,300	1,300	2.00	0.810 J	97.3	62.9

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Appendix A
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Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	CM SHAFT / -- / 41894.00 / CM-50(091214)	CM SHAFT / -- / 41900.00 / CM-100(091814)	CM SHAFT / -- / 41900.00 / CM-160(091814)	CM SHAFT / -- / 41901.00 / CM-275(091914)	OB-02 / -- / 41897.00 / OB-2(091514)	OB-02 / -- / 42228.00 / OB-2-081215	OB-03 / -- / 41890.00 / DUP(090814)	OB-03 / -- / 41890.00 / OB-3(090814)
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	NA	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	NA	1.30	NA	4.60	NA	<0.500	NA	NA
Potassium	ug/L	--	(j)	2,660	3,480	4,110	4,520	1,510	1,300	1,020	996
Selenium	ug/L	5	(d)	5.40	NA	NA	NA	NA	<0.600	NA	NA
Silver	ug/L	0.12	(c)	3.40	3.20	2.00	2.60	NA	<0.500	NA	NA
Sodium	ug/L	--	(j)	107,000	88,300	83,700	79,400	4,110	3,900	3,400	3,360
Thallium	ug/L	10	(c)	NA	NA	NA	NA	NA	<0.200	NA	NA
Vanadium	ug/L	12	(c)	NA	NA	NA	NA	NA	<1.80 B	NA	NA
Zinc	ug/L	71.69	(a)	1,290	1,680	2,030	3,610	NA	<10.0	NA	7.70
Miscellaneous											
Alkalinity	ug/L	--		154,000	199,000	205,000	258,000	54,800	37,600	58,400	60,500
Alkalinity, Bicarbonate	ug/L	--		NA	NA	NA	NA	NA	37,600	NA	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		233,000	187,000	162,000	151,000	3,300	2,180	2,000	2,000
Cyanide	ug/L	--		NA	NA	NA	NA	NA	<7	NA	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		NA	NA	NA	NA	16,400	10,100	12,600	12,900
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-03 / -- / 42226.00 / OB-3-081015	OB-04 / -- / 41897.00 / OB-4(091514)	OB-04 / -- / 42226.00 / OB-4-081015	OB-05 / -- / 41890.00 / OB-5(090814)	OB-05 / -- / 42226.00 / OB-5-081015	OB-06 / -- / 41890.00 / OB-6(090814)	OB-06 / -- / 42222.00 / OB-6-080615	OB-07 / -- / 41887.00 / DUP(090514)
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	<0.43	NA	<0.43	NA	<0.57	NA
Aroclor-1221	ug/L	--		<0.34	NA	<0.34	NA	<0.34	NA	<0.45	NA
Aroclor-1232	ug/L	--		<0.4	NA	<0.4	NA	<0.4	NA	<0.53	NA
Aroclor-1242	ug/L	--		<0.22	NA	<0.22	NA	<0.22	NA	<0.29	NA
Aroclor-1248	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	<0.2	NA
Aroclor-1254	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.22	NA
Aroclor-1260	ug/L	--		<0.18	NA	<0.18	NA	<0.18	NA	<0.24	NA
Total PCBs	ug/L	--		<0.43	NA	<0.43	NA	<0.43	NA	<0.66	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		<0.24	NA	<0.24	NA	0.37 J	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		<0.54	NA	<0.54	NA	<0.54	NA	<2.1	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	NA	<0.17	NA	0.2 J	NA	<0.17	NA
2-Butanone	ug/L	--		<2.6	NA	<2.6	NA	<2.6	NA	<2.6	NA
2-Hexanone	ug/L	--		<1.3	NA	<1.3	NA	<1.3	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		<0.81	NA	<0.81	NA	<0.81	NA	<0.81	NA
Acetone	ug/L	--		<2.7	NA	<2.7	NA	<2.7	NA	<2.7	NA
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Bromoform	ug/L	230	(c)	<0.29	NA	<0.29	NA	<0.29	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	<0.35	NA	<0.35	NA	<0.35	NA	<0.35	NA
Carbon Disulfide	ug/L	--		<0.22	NA	<0.22	NA	<0.22	NA	<0.22	NA
Carbon Tetrachloride	ug/L	240	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chloroethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36	NA	<0.36	NA
Chloroform	ug/L	140	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	NA
Chloromethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36	NA	<0.36	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	NA	<0.21	NA	<0.21	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA

Appendix A
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Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-03	OB-04	OB-04	OB-05	OB-05	OB-06	OB-06	OB-07
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42226.00	41897.00	42226.00	41890.00	42226.00	41890.00	42222.00	41887.00
Sample Name:	Units	Chronic	Note	OB-3-081015	OB-4(091514)	OB-4-081015	OB-5(090814)	OB-5-081015	OB-6(090814)	OB-6-080615	DUP(090514)
Dichlorodifluoromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Isopropylbenzene	ug/L	--		<0.33	NA	<0.33	NA	<0.33	NA	<0.33	NA
Methyl acetate	ug/L	--		<0.58	NA	<0.58	NA	<0.58	NA	<0.58	NA
Methylcyclohexane	ug/L	--		<0.09	NA	<0.09	NA	<0.09	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	<0.22	NA	<0.22	NA	<0.22	NA	<0.22	NA
Styrene	ug/L	32	(c)	<0.28	NA	<0.28	NA	<0.28	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	<0.14	NA	<0.14	NA	<0.14	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		<0.21	NA	<0.21	NA	<0.21	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Benzene	ug/L	114	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
Toluene	ug/L	253	(c)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Ethylbenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	<0.58	NA	<0.58	NA	<0.58	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	NA	<0.17	NA	0.27 J	0.38	<0.17	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	<0.27	NA	<0.27	NA	0.35 J	NA	<0.27	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<0.71	NA	<0.72	NA	<0.72	NA	<2.8	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<1.8	NA	<1.8	NA	<1.8	NA	<6.9	NA
2,4,5-Trichlorophenol	ug/L	--		<1.8	NA	<1.8	NA	<1.8	NA	<7.1	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<1.7	NA	<1.7	NA	<1.8	NA	<6.8	NA
2,4-Dichlorophenol	ug/L	11	(c)	<1.4	NA	<1.4	NA	<1.4	NA	<5.6	NA
2,4-Dimethylphenol	ug/L	100	(c)	<1.1	NA	<1.1	NA	<1.1	NA	<4.2	NA
2,4-Dinitrophenol	ug/L	19	(c)	<1.5	NA	<1.5	NA	<1.5	NA	<5.9	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<0.82	NA	<0.82	NA	<0.82	NA	<3.2	NA
2,6-Dinitrotoluene	ug/L	--		<0.59	NA	<0.59	NA	<0.59	NA	<2.3	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<0.71	NA	<0.72	NA	<0.72	NA	<2.8	NA
2-Chlorophenol	ug/L	24	(c)	<1.2	NA	<1.2	NA	<1.2	NA	<4.8	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.1	NA	<0.1	NA	<0.1	NA	<0.4	NA
2-Methylphenol	ug/L	--		<0.59	NA	<0.59	NA	<0.59	NA	<2.3	NA
2-Nitroaniline	ug/L	--		<0.94	NA	<0.95	NA	<0.95	NA	<3.7	NA
2-Nitrophenol	ug/L	--		<1.4	NA	<1.4	NA	<1.4	NA	<5.3	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<0.84	NA	<0.85	NA	<0.85	NA	<3.3	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<0.56	NA	<0.56	NA	<0.57	NA	<2.2	NA
3-Nitroaniline	ug/L	--		<0.69	NA	<0.69	NA	<0.7	NA	<2.7	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<2.4	NA	<2.4	NA	<2.4	NA	<9.3	NA
4-Bromophenyl-phenylether	ug/L	--		<0.69	NA	<0.69	NA	<0.7	NA	<2.7	NA
4-Chloro-3-Methylphenol	ug/L	--		<1.1	NA	<1.2	NA	<1.2	NA	<4.5	NA

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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-03 / -- / 42226.00 / OB-3-081015	OB-04 / -- / 41897.00 / OB-4(091514)	OB-04 / -- / 42226.00 / OB-4-081015	OB-05 / -- / 41890.00 / OB-5(090814)	OB-05 / -- / 42226.00 / OB-5-081015	OB-06 / -- / 41890.00 / OB-6(090814)	OB-06 / -- / 42222.00 / OB-6-080615	OB-07 / -- / 41887.00 / DUP(090514)
4-Chloroaniline	ug/L	--		<1.1	NA	<1.1	NA	<1.1	NA	<4.2	NA
4-Chlorophenyl-phenylether	ug/L	--		<0.71	NA	<0.72	NA	<0.72	NA	<2.8	NA
4-Nitroaniline	ug/L	--		<0.79	NA	<0.79	NA	<0.8	NA	<3.1	NA
4-Nitrophenol	ug/L	60	(c)	<1.4	NA	<1.4	NA	<1.4	NA	<5.4	NA
Acenaphthene	ug/L	38	(c)	<0.082	NA	<0.082	NA	<0.082	NA	<0.32	NA
Acenaphthylene	ug/L	4840	(c)	<0.089	NA	<0.09	NA	<0.09	NA	<0.35	NA
Acetophenone	ug/L	--		<0.59	NA	<0.59	NA	<0.59	NA	<2.3	NA
Anthracene	ug/L	0.035	(c)	<0.097	NA	<0.097	NA	<0.098	NA	<0.38	NA
Atrazine	ug/L	--		<0.74	NA	<0.74	NA	<0.75	NA	<2.9	NA
Benzaldehyde	ug/L	--		<1.5	NA	<1.5	NA	<1.5	NA	<5.7	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.16	NA	<0.16	NA	<0.16	NA	<0.62	NA
Benzo(k)fluoranthene	ug/L	--		<0.094	NA	<0.095	NA	<0.095	NA	<0.37	NA
bis(2-Chloroethoxy)methane	ug/L	--		<0.79	NA	<0.79	NA	<0.8	NA	<3.1	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<0.71	NA	<0.72	NA	<0.72	NA	<2.8	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	6.3 B	NA	<1.7 B	NA	<2.2 B	NA	<6	NA
Butylbenzylphthalate	ug/L	23	(c)	<0.64	NA	<0.64	NA	<0.64	NA	<2.5	NA
Caprolactam	ug/L	--		<0.61	NA	<0.62	NA	<0.62	NA	<2.4	NA
Carbazole	ug/L	--		<0.71	NA	<0.72	NA	<0.72	NA	<2.8	NA
Chrysene	ug/L	--		<0.084	NA	<0.085	NA	<0.085	NA	<0.33	NA
Cyclohexane	ug/L	--		<0.13	NA	<0.13	NA	<0.13	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		<0.11	NA	<0.12	NA	<0.12	NA	<0.45	NA
Dibenzofuran	ug/L	--		<0.74	NA	<0.74	NA	<0.75	NA	<2.9	NA
Diethylphthalate	ug/L	110	(c)	<0.77	NA	<0.77	NA	<0.77	NA	<3	NA
Dimethylphthalate	ug/L	--		<0.79	NA	<0.79	NA	<0.8	NA	<3.1	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<0.64	4.7	<0.64	NA	<0.64	NA	<2.5	NA
Di-n-Octylphthalate	ug/L	--		<0.64	NA	<0.64	NA	<0.64	NA	<2.5	NA
Diphenyl ether	ug/L	--		<0.56	NA	<0.56	NA	<0.57	NA	<2.2	NA
Fluoranthene	ug/L	1.9	(c)	<0.082	NA	<0.082	NA	<0.082	NA	<0.32	NA
Fluorene	ug/L	19	(c)	<0.082	NA	<0.082	NA	<0.082	NA	<0.32	NA
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	<0.014	NA	<0.014	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<0.46	NA	<0.46	NA	<0.46	NA	<1.8	NA
Hexachloroethane	ug/L	8	(c)	<0.48	NA	<0.49	NA	<0.49	NA	<1.9	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.1	NA	<0.11	NA	<0.11	NA	<0.41	NA
Isophorone	ug/L	920	(c)	<0.79	NA	<0.79	NA	<0.8	NA	<3.1	NA
Naphthalene	ug/L	13	(c)	<0.094	NA	<0.095	NA	<0.095	NA	<0.37	NA
Nitrobenzene	ug/L	220	(c)	<0.69	NA	<0.69	NA	<0.7	NA	<2.7	NA
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		<0.87	NA	<0.87	NA	<0.88	NA	<3.4	NA
N-Nitrosodiphenylamine	ug/L	--		<0.92	NA	<0.92	NA	<0.93	NA	<3.6	NA

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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-03 / -- / 42226.00 / OB-3-081015	OB-04 / -- / 41897.00 / OB-4(091514)	OB-04 / -- / 42226.00 / OB-4-081015	OB-05 / -- / 41890.00 / OB-5(090814)	OB-05 / -- / 42226.00 / OB-5-081015	OB-06 / -- / 41890.00 / OB-6(090814)	OB-06 / -- / 42222.00 / OB-6-080615	OB-07 / -- / 41887.00 / DUP(090514)
Pentachlorophenol	ug/L	--		<0.1	NA	<0.1	NA	<0.1	NA	<0.1	NA
Phenanthrene	ug/L	3.6	(c)	<0.11	NA	<0.11	NA	<0.11	NA	<0.42	NA
Phenol	ug/L	180	(c)	<0.38	NA	<0.38	NA	<0.39	NA	<1.5	NA
Pyrene	ug/L	0.3	(c)	<0.089	NA	<0.09	NA	<0.09	NA	<0.35	NA
Inorganics											
Aluminum	ug/L	87	(i)	<9.60	64.4	9.60 J	NA	<9.60	NA	<9.60	NA
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	<0.500	NA	<0.500	NA	<0.500	NA	<0.700 B	NA
Barium	ug/L	220	(c)	2.90	70.2	90.0	25.7	26.0	14.3	20.0	19.3
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	17,300	60,200	86,700	76,600	82,000	20,400	24,300	77,700
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	1.60	<0.500	NA	<0.500	NA
Cobalt	ug/L	24	(c)	<0.500	0.900	1.10 J	NA	5.20	9.50	7.30	2.90
Copper	ug/L	5.56	(a)	<0.500	1.20	<0.500	3.90	<0.500	3.80	3.00	7.60
Iron	ug/L	--	(j)	1,800	11,300	13,500	44,700	31,300	1,670	3,800	3,210
Lead	ug/L	5.4	(d) (e)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Magnesium	ug/L	--	(j)	4,900	17,400	25,000	38,000	39,500	5,090	5,900	30,500
Manganese	ug/L	120	(i)	130	1,610	2,600	2,250	2,200	1,100	760	2,820
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	<0.500	1.70	0.870 J	NA	2.00	1.60	1.80 J	1.70
Potassium	ug/L	--	(j)	1,100	2,820	3,900	3,580	3,600	1,670	1,900	3,000
Selenium	ug/L	5	(d)	<0.600	NA	<0.600	NA	<0.600 J	NA	<0.600	4.00
Silver	ug/L	0.12	(c)	<0.500	1.70	<0.500	NA	<0.500	NA	<0.500	NA
Sodium	ug/L	--	(j)	3,500	103,000	109,000	30,400	32,100	13,100	15,800	10,400
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	<1.10 B	4.00	<1.70 B	NA	<1.20 B	NA	<1.50 B	1.80
Zinc	ug/L	71.69	(a)	<10.0	NA	<10.0	8.10	<10.0	NA	<10.0	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	<9.60	53.3	<9.60	NA	<9.60	NA	<9.60	NA
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	<0.500	NA	<0.500	NA	<0.500	NA	<0.760 B	NA
Barium	ug/L	220	(c)	2.90	61.3	79.0	9.30	15.0	13.9	20.0	18.2
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	16,900	59,200	86,300	70,900	82,600	19,900	23,800	78,500
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	NA	4.50	9.20	7.60	2.60
Copper	ug/L	5.56	(a)	<0.500	3.10	<0.500	2.50	<0.500	3.40	1.20 J	NA
Iron	ug/L	--	(j)	110	5,730	6,300	3,340	8,400	54.3	320	341
Lead	ug/L	5.4	(d) (e)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Magnesium	ug/L	--	(j)	4,800	17,300	24,900	35,800	40,400	4,970	5,900	31,000
Manganese	ug/L	120	(i)	120	1,570	2,700	2,090	2,300	1,080	730	2,760

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Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	<0.500	1.50	1.10 J	1.10	1.50 J	1.50	1.60 J	1.80
Potassium	ug/L	--	(j)	1,100	2,740	3,800	3,350	3,700	1,600	1,800	3,010
Selenium	ug/L	5	(d)	<0.600	NA	<0.600	NA	<0.600	NA	<0.600	4.80
Silver	ug/L	0.12	(c)	<0.500	1.20	<0.500	NA	<0.500	NA	<0.500	NA
Sodium	ug/L	--	(j)	3,400	99,900	97,200	28,700	32,700	12,800	15,700	10,500
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	<0.820 B	2.30	<0.960 B	NA	<0.840 B	NA	<1.20 B	NA
Zinc	ug/L	71.69	(a)	<10.0	NA	<10.0	NA	<10.0	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		47,700	156,000	204,000	320,000	318,000	78,900	82,500	391,000
Alkalinity, Bicarbonate	ug/L	--		47,700	NA	204,000	NA	318,000	NA	82,500	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		1,660	213,000	238,000	58,400	67,000	2,500	14,700	9,500
Cyanide	ug/L	--		<7	NA	10	NA	<7 J	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		8,500	NA	3,150	NA	4,490	12,500	21,800	NA
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-07	OB-07	OB-10	OB-10	OB-10	OB-10	OB-11R	OB-11R
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41887.00	42240.00	41891.00	41891.00	42230.00	42230.00	41893.00	41893.00
Sample Name:	Units	Chronic	Note	OB-7(090514)	OB-7-082415	DUP(090914)	OB-10(090914)	DUP-03-081415	OB-10-081415	DUP(091114)	OB-11R(091114)
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	NA	<0.43	<0.43	NA	NA
Aroclor-1221	ug/L	--		NA	<0.34	NA	NA	<0.34	<0.34	NA	NA
Aroclor-1232	ug/L	--		NA	<0.4	NA	NA	<0.4	<0.4	NA	NA
Aroclor-1242	ug/L	--		NA	<0.22	NA	NA	<0.22	<0.22	NA	NA
Aroclor-1248	ug/L	--		NA	<0.15	NA	NA	<0.15	<0.15	NA	NA
Aroclor-1254	ug/L	--		NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Aroclor-1260	ug/L	--		NA	<0.18	NA	NA	<0.18	<0.18	NA	NA
Total PCBs	ug/L	--		NA	<0.43	NA	NA	<0.43	<0.43	NA	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.19	NA	NA	<0.19	<0.19	NA	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.19	NA	NA	<0.19	<0.19	NA	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.15	NA	NA	<0.15	<0.15	NA	NA
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.19	NA	NA	<0.19	<0.19	NA	NA
1,1-Dichloroethane	ug/L	--		NA	<0.24	NA	NA	<0.24	<0.24	NA	NA
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.25	NA	NA	<0.25	<0.25	NA	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<1.9	NA	NA	<2.1	<2.1	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,2-Dibromoethane	ug/L	--		NA	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	NA	NA	<0.19	<0.19	NA	NA
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.2	NA	NA	<0.2	<0.2	NA	NA
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.25	NA	NA	<0.25	<0.25	NA	NA
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.18	NA	NA	<0.18	<0.18	NA	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	0.18 J	NA	NA	<0.17	<0.17	NA	NA
2-Butanone	ug/L	--		NA	<2.6	NA	NA	<2.6	<2.6	NA	NA
2-Hexanone	ug/L	--		NA	<1.3	NA	NA	<1.3	<1.3	NA	NA
4-Methyl-2-pentanone	ug/L	--		NA	<0.81	NA	NA	<0.81	<0.81	NA	NA
Acetone	ug/L	--		NA	<2.7	NA	NA	<2.7	<2.7	NA	NA
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Bromoform	ug/L	230	(c)	NA	<0.29	NA	NA	<0.29	<0.29	NA	NA
Bromomethane	ug/L	16	(c)	NA	<0.35	NA	NA	<0.35 J	<0.35 J	NA	NA
Carbon Disulfide	ug/L	--		NA	<0.22	NA	NA	<0.22	<0.22	NA	NA
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.18	NA	NA	<0.18	<0.18	NA	NA
Chlorobenzene	ug/L	47	(c)	NA	<0.18	NA	NA	<0.18	<0.18	NA	NA
Chloroethane	ug/L	--		NA	<0.36	NA	NA	<0.36	<0.36	NA	21.2
Chloroform	ug/L	140	(c)	NA	<0.23	NA	NA	<0.23	<0.23	NA	NA
Chloromethane	ug/L	--		NA	<0.36 J	NA	NA	<0.36	<0.36	NA	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.21	NA	NA	<0.21	<0.21	NA	NA
cis-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	1.9
Dibromochloromethane	ug/L	--		NA	<0.25	NA	NA	<0.25	<0.25	NA	NA

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-07 -- 41887.00 OB-7(090514)	OB-07 -- 42240.00 OB-7-082415	OB-10 -- 41891.00 DUP(090914)	OB-10 -- 41891.00 OB-10(090914)	OB-10 -- 42230.00 DUP-03-081415	OB-10 -- 42230.00 OB-10-081415	OB-11R -- 41893.00 DUP(091114)	OB-11R -- 41893.00 OB-11R(091114)
Dichlorodifluoromethane	ug/L	--		NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Isopropylbenzene	ug/L	--		NA	<0.33	NA	NA	<0.33	<0.33	NA	0.58
Methyl acetate	ug/L	--		NA	<0.58 J	NA	NA	<0.58	<0.58	NA	NA
Methylcyclohexane	ug/L	--		NA	<0.09	NA	NA	<0.09	<0.09	NA	0.44
Methylene Chloride	ug/L	940	(c)	NA	<0.22	NA	NA	<0.22	<0.22	NA	NA
Styrene	ug/L	32	(c)	NA	<0.28	NA	NA	<0.28	<0.28	NA	NA
Tetrachloroethene	ug/L	45	(c)	NA	<0.14	NA	NA	<0.14	<0.14	NA	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.23	NA	NA	<0.23	<0.23	NA	NA
trans-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Trichloroethene	ug/L	47	(c)	NA	<0.2	NA	NA	<0.2	<0.2	NA	NA
Trichlorofluoromethane	ug/L	--		NA	<0.21	NA	NA	<0.21	<0.21	NA	NA
Vinyl Chloride	ug/L	930	(c)	NA	<0.18	NA	NA	<0.18	<0.18	NA	NA
Benzene	ug/L	114	(c)	NA	<0.2	NA	NA	<0.2	<0.2	NA	3.5
Toluene	ug/L	253	(c)	NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Ethylbenzene	ug/L	14	(c)	NA	<0.19	NA	NA	<0.19	<0.19	NA	NA
Xylenes (total)	ug/L	27	(c)	NA	<0.58	NA	NA	<0.58	<0.58	NA	NA
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.17	NA	NA	<0.17	<0.17	NA	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.2	NA	NA	<0.2	<0.2	NA	NA
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	NA	NA	<0.27	<0.27	NA	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.6 J	NA	NA	<2.8	<2.8	NA	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.4	NA	NA	<6.9	<6.9	NA	NA
2,4,5-Trichlorophenol	ug/L	--		NA	<6.6	NA	NA	<7.1	<7.1	NA	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.3	NA	NA	<6.8	<6.8	NA	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.2	NA	NA	<5.6	<5.6	NA	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	<3.9	NA	NA	<4.2	<4.2	NA	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.5	NA	NA	<5.9	<5.9	NA	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3	NA	NA	<3.2	<3.2	NA	NA
2,6-Dinitrotoluene	ug/L	--		NA	<2.1	NA	NA	<2.3	<2.3	NA	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.6	NA	NA	<2.8	<2.8	NA	NA
2-Chlorophenol	ug/L	24	(c)	NA	<4.4	NA	NA	<4.8	<4.8	NA	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.37	NA	NA	<0.4	<0.4	NA	NA
2-Methylphenol	ug/L	--		NA	<2.1	NA	NA	<2.3	<2.3	NA	NA
2-Nitroaniline	ug/L	--		NA	<3.4	NA	NA	<3.7	<3.7	NA	NA
2-Nitrophenol	ug/L	--		NA	<4.9	NA	NA	<5.3	<5.3	NA	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.1	NA	NA	<3.3	<3.3	NA	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2	NA	NA	<2.2	<2.2	NA	NA
3-Nitroaniline	ug/L	--		NA	<2.5	NA	NA	<2.7	<2.7	NA	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<8.6	NA	NA	<9.3	<9.3	NA	NA
4-Bromophenyl-phenylether	ug/L	--		NA	<2.5	NA	NA	<2.7	<2.7	NA	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.2	NA	NA	<4.5	<4.5	NA	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-07	OB-07	OB-10	OB-10	OB-10	OB-10	OB-11R	OB-11R
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41887.00	42240.00	41891.00	41891.00	42230.00	42230.00	41893.00	41893.00
Sample Name:	Units	Chronic	Note	OB-7(090514)	OB-7-082415	DUP(090914)	OB-10(090914)	DUP-03-081415	OB-10-081415	DUP(091114)	OB-11R(091114)
4-Chloroaniline	ug/L	--		NA	<3.9	NA	NA	<4.2	<4.2	NA	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.6	NA	NA	<2.8	<2.8	NA	NA
4-Nitroaniline	ug/L	--		NA	<2.9	NA	NA	<3.1	<3.1	NA	NA
4-Nitrophenol	ug/L	60	(c)	NA	<5	NA	NA	<5.4	<5.4	NA	NA
Acenaphthene	ug/L	38	(c)	NA	<0.3	NA	NA	<0.32	<0.32	NA	0.203
Acenaphthylene	ug/L	4840	(c)	NA	<0.32	NA	NA	<0.35	<0.35	NA	NA
Acetophenone	ug/L	--		NA	<2.1	NA	NA	<2.3	<2.3	NA	NA
Anthracene	ug/L	0.035	(c)	NA	<0.35	NA	NA	<0.38	<0.38	NA	NA
Atrazine	ug/L	--		NA	<2.7	NA	NA	<2.9	<2.9	NA	NA
Benzaldehyde	ug/L	--		NA	<5.3	NA	NA	<5.7	<5.7	NA	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.023	NA	NA	<0.025	<0.025	NA	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.023	NA	NA	<0.025	<0.025	NA	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.023	NA	NA	<0.025	<0.025	NA	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.57	NA	NA	<0.62	<0.62	NA	NA
Benzo(k)fluoranthene	ug/L	--		NA	<0.34	NA	NA	<0.37	<0.37	NA	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	<2.9	NA	NA	<3.1	<3.1	NA	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.6	NA	NA	<2.8	<2.8	NA	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<5.6	NA	NA	<6	<6	NA	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.3	NA	NA	<2.5	<2.5	NA	NA
Caprolactam	ug/L	--		NA	<2.2	NA	NA	<2.4	<2.4	NA	NA
Carbazole	ug/L	--		NA	<2.6	NA	NA	<2.8	<2.8	NA	NA
Chrysene	ug/L	--		NA	<0.31	NA	NA	<0.33	<0.33	NA	NA
Cyclohexane	ug/L	--		NA	<0.13	NA	NA	<0.13	<0.13	NA	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.42	NA	NA	<0.45	<0.45	NA	NA
Dibenzofuran	ug/L	--		NA	<2.7	NA	NA	<2.9	<2.9	NA	NA
Diethylphthalate	ug/L	110	(c)	NA	<2.8	NA	NA	<3	<3	NA	NA
Dimethylphthalate	ug/L	--		NA	<2.9	NA	NA	<3.1	<3.1	NA	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.3	NA	NA	<2.5	<2.5	NA	NA
Di-n-Octylphthalate	ug/L	--		NA	<2.3	0.98	NA	<2.5	<2.5	NA	NA
Diphenyl ether	ug/L	--		NA	<2	NA	NA	<2.2	<2.2	NA	NA
Fluoranthene	ug/L	1.9	(c)	NA	<0.3	NA	NA	<0.32	<0.32	NA	NA
Fluorene	ug/L	19	(c)	NA	<0.3	NA	NA	<0.32	<0.32	NA	0.146
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.013	NA	NA	<0.014	<0.014	NA	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.19	NA	NA	<0.2	<0.2	NA	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.7	NA	NA	<1.8	<1.8	NA	NA
Hexachloroethane	ug/L	8	(c)	NA	<1.8	NA	NA	<1.9	<1.9	NA	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.38	NA	NA	<0.41	<0.41	NA	NA
Isophorone	ug/L	920	(c)	NA	<2.9	NA	NA	<3.1	<3.1	NA	NA
Naphthalene	ug/L	13	(c)	NA	<0.34	NA	NA	<0.37	<0.37	NA	0.488
Nitrobenzene	ug/L	220	(c)	NA	<2.5	NA	NA	<2.7	<2.7	NA	NA
N-Nitrosodimethylamine	ug/L	--		NA	<0.19	NA	NA	<0.2	<0.2	NA	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.1	NA	NA	<3.4	<3.4	NA	NA
N-Nitrosodiphenylamine	ug/L	--		NA	<3.3	NA	NA	<3.6	<3.6	NA	NA

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-07 - - 41887.00 OB-7(090514)	OB-07 - - 42240.00 OB-7-082415	OB-10 - - 41891.00 DUP(090914)	OB-10 - - 41891.00 OB-10(090914)	OB-10 - - 42230.00 DUP-03-081415	OB-10 - - 42230.00 OB-10-081415	OB-11R - - 41893.00 DUP(091114)	OB-11R - - 41893.00 OB-11R(091114)
Pentachlorophenol	ug/L	--		NA	<0.093	NA	NA	<0.1	<0.1	NA	NA
Phenanthrene	ug/L	3.6	(c)	NA	<0.39	NA	NA	<0.42	<0.42	NA	0.191
Phenol	ug/L	180	(c)	NA	<1.4	NA	NA	<1.5	<1.5	NA	NA
Pyrene	ug/L	0.3	(c)	NA	<0.32	NA	NA	<0.35	<0.35	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	<9.60	NA	NA	<9.60	<9.60	NA	NA
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	0.570 J	NA	NA	<1.30 B	<1.30 B	31.0	26.6
Barium	ug/L	220	(c)	19.2	18.0	6.90	7.20	6.90	6.80	NA	96.9
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	<0.400	<0.400	NA	NA
Calcium	ug/L	--	(j)	75,300	76,500	13,800	14,600	13,900	13,400	NA	56,600
Chromium	ug/L	42	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	NA
Cobalt	ug/L	24	(c)	2.90	3.20	NA	NA	<0.500	<0.500	NA	NA
Copper	ug/L	5.56	(a)	10.6	3.00	NA	NA	<0.500	<0.500	NA	NA
Iron	ug/L	--	(j)	4,020	1,700	58.3	110	290	250	NA	66,100
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	<0.200	<0.200	NA	NA
Magnesium	ug/L	--	(j)	29,600	28,000	4,030	4,280	4,000	3,800	NA	6,970
Manganese	ug/L	120	(i)	2,730	2,700	7.80	14.7	33.0	29.0	NA	11,200
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	<0.150	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	2.40	1.90 J	1.30	NA	1.30 J	<0.500	NA	NA
Potassium	ug/L	--	(j)	2,920	2,800	1,190	1,290	1,300	1,200	NA	2,980
Selenium	ug/L	5	(d)	5.70	<0.600	NA	NA	<0.600	0.800 J	NA	5.10
Silver	ug/L	0.12	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	10.2
Sodium	ug/L	--	(j)	10,100	10,200	3,150	3,330	3,300	3,100	NA	3,680
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	<0.200	0.240 J	NA	NA
Vanadium	ug/L	12	(c)	2.00	<1.70 B	NA	NA	<1.10 B	<1.00 B	NA	NA
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	NA	<10.0	<10.0	NA	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.60	NA	NA	<9.60	<9.60	NA	NA
Antimony	ug/L	80	(c)	NA	0.500 J	NA	NA	<0.500	0.510 J	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	<0.500	NA	NA	<0.500	<0.500	NA	6.10
Barium	ug/L	220	(c)	16.9	17.0	6.90	6.70	6.20	6.50	NA	62.5
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	<0.400	<0.400	NA	NA
Calcium	ug/L	--	(j)	74,300	78,100	14,000	13,700	13,700	14,000	NA	54,900
Chromium	ug/L	42	(c)	0.900	<0.500	NA	NA	<0.500	<0.500	NA	NA
Cobalt	ug/L	24	(c)	2.40	3.30	NA	NA	<0.500	<0.500	NA	NA
Copper	ug/L	5.56	(a)	NA	1.20 J	NA	NA	<0.500	<0.500	NA	NA
Iron	ug/L	--	(j)	318	13.0 J	NA	NA	<10.0	13.0 J	NA	40,300
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	<0.200	<0.200	NA	NA
Magnesium	ug/L	--	(j)	29,400	30,700	4,110	3,980	4,100	4,100	NA	6,820
Manganese	ug/L	120	(i)	2,630	2,700 E	NA	0.500	0.640 J	0.780 J	NA	11,200

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-07	OB-07	OB-10	OB-10	OB-10	OB-10	OB-11R	OB-11R
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41887.00	42240.00	41891.00	41891.00	42230.00	42230.00	41893.00	41893.00
Sample Name:	Units	Chronic	Note	OB-7(090514)	OB-7-082415	DUP(090914)	OB-10(090914)	DUP-03-081415	OB-10-081415	DUP(091114)	OB-11R(091114)
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	<0.150	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	1.70	2.20	NA	NA	<0.500	<0.500	NA	NA
Potassium	ug/L	--	(j)	2,830	2,900	1,210	1,170	1,200	1,200	NA	2,860
Selenium	ug/L	5	(d)	6.50	<0.600	NA	NA	<0.600	<0.600	NA	4.90
Silver	ug/L	0.12	(c)	NA	<0.500	NA	NA	<0.500	<0.500	NA	9.00
Sodium	ug/L	--	(j)	9,950	11,100	3,210	3,110	3,300	3,400	NA	3,550
Thallium	ug/L	10	(c)	NA	0.590 J	NA	NA	<0.200	<0.200	NA	NA
Vanadium	ug/L	12	(c)	NA	<1.90 B	NA	NA	<1.60 B	<1.60 B	NA	NA
Zinc	ug/L	71.69	(a)	16.9	<10.0	NA	7.90	<10.0	<10.0	NA	NA
Miscellaneous											
Alkalinity	ug/L	--		296,000	297,000	49,700	47,700	43,600	43,900	NA	203,000
Alkalinity, Bicarbonate	ug/L	--		NA	297,000	NA	NA	43,600	43,900	NA	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		9,600	8,060	3,100	3,000	3,390	3,430	NA	2,000
Cyanide	ug/L	--		NA	9.5 J	NA	NA	<7	<7	NA	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		NA	7,390	NA	NA	5,850	5,880	NA	NA
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

ED_001829_00000091-00083

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-11R / -- / 42115.00 / OB-11R-042115	OB-11R / -- / 42222.00 / OB-11R-080615	OB-11R / -- / 42353.00 / OB-11R-121515	OB-12 / -- / 41897.00 / OB-12(091514)	OB-12 / -- / 42226.00 / OB-12-081015	OB-13 / -- / 41890.00 / OB-13(090814)	OB-13 / -- / 42226.00 / DUP-02-081015	OB-13 / -- / 42226.00 / OB-13-081015
PCBs											
Aroclor-1016	ug/L	--		NA	<0.57	NA	NA	<0.43	NA	<0.43	<0.43
Aroclor-1221	ug/L	--		NA	<0.45	NA	NA	<0.34	NA	<0.34	<0.34
Aroclor-1232	ug/L	--		NA	<0.53	NA	NA	<0.4	NA	<0.4	<0.4
Aroclor-1242	ug/L	--		NA	<0.29	NA	NA	<0.22	NA	<0.22	<0.22
Aroclor-1248	ug/L	--		NA	<0.2	NA	NA	<0.15	NA	<0.15	<0.15
Aroclor-1254	ug/L	--		NA	<0.22	NA	NA	<0.17	NA	<0.17	<0.17
Aroclor-1260	ug/L	--		NA	<0.24	NA	NA	<0.18	NA	<0.18	<0.18
Total PCBs	ug/L	--		NA	<0.66	NA	NA	<0.43	NA	<0.43	<0.43
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.25	<0.19	<0.28	NA	<0.19	NA	<0.19	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.21	<0.19	<0.19	NA	<0.19	NA	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.52	<0.15	<0.34	NA	<0.15	NA	<0.15	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.21	<0.19	<0.08	NA	<0.19	NA	<0.19	<0.19
1,1-Dichloroethane	ug/L	--		<0.17	0.32 J	0.25 J	NA	<0.24	NA	<0.24	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.51	<0.25	<0.34	NA	<0.25	NA	<0.25	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<2.1	NA	NA	<0.54	NA	<0.55	<0.53
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.99	<0.01	<0.007	NA	<0.01	NA	<0.01	<0.01
1,2-Dibromoethane	ug/L	--		<0.23	<0.01	<0.006	NA	<0.01	NA	<0.01	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.19	<0.22	NA	<0.19	NA	<0.19	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.18	<0.2	<0.25	NA	<0.2	NA	<0.2	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.39	<0.25	<0.18	NA	<0.25	NA	<0.25	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.23	<0.18	<0.33	NA	<0.18	NA	<0.18	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.27	<0.17	<0.33	NA	<0.17	NA	<0.17	<0.17
2-Butanone	ug/L	--		<5.6	<2.6	<2.2	NA	<2.6	NA	<2.6	<2.6
2-Hexanone	ug/L	--		<1.7	<1.3	<0.72	NA	<1.3	NA	<1.3	<1.3
4-Methyl-2-pentanone	ug/L	--		<1	<0.81	<0.63	NA	<0.81	NA	<0.81	<0.81
Acetone	ug/L	--		11.2	<2.7	<1.1	NA	<2.7	NA	<2.7	<2.7
Bromochloromethane	ug/L	--		NA	NA	<0.3	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.23	<0.17	<0.15	NA	<0.17	NA	<0.17	<0.17
Bromoform	ug/L	230	(c)	<0.23	<0.29	<0.18	NA	<0.29	NA	<0.29	<0.29
Bromomethane	ug/L	16	(c)	<0.42	<0.35	<0.18	NA	<0.35	NA	<0.35	<0.35
Carbon Disulfide	ug/L	--		<0.25	<0.22	<0.22	NA	<0.22	NA	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.22	<0.18	<0.33	NA	<0.18	NA	<0.18	<0.18
Chlorobenzene	ug/L	47	(c)	<0.19	<0.18	<0.24	NA	<0.18	NA	<0.18	<0.18
Chloroethane	ug/L	--		21.2	23	30	NA	<0.36	NA	<0.36	<0.36
Chloroform	ug/L	140	(c)	<0.19	<0.23	<0.22	NA	<0.23	NA	<0.23	<0.23
Chloromethane	ug/L	--		<0.41	<0.36	<0.22	NA	<0.36	NA	<0.36	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.27	0.37 J	0.43 J	NA	<0.21	NA	<0.21	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.21	<0.17	<0.16	NA	<0.17	NA	<0.17	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.15	<0.25	<0.22	NA	<0.25	NA	<0.25	<0.25

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-11R	OB-11R	OB-11R	OB-12	OB-12	OB-13	OB-13	OB-13
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				42115.00	42222.00	42353.00	41897.00	42226.00	41890.00	42226.00	42226.00
Sample Name:	Units	Chronic	Note	OB-11R-042115	OB-11R-080615	OB-11R-121515	OB-12(091514)	OB-12-081015	OB-13(090814)	DUP-02-081015	OB-13-081015
Dichlorodifluoromethane	ug/L	--		<0.9	<0.17	<0.14	NA	<0.17	NA	<0.17	<0.17
Isopropylbenzene	ug/L	--		0.81 J	0.36 J	0.35 J	NA	<0.33	NA	<0.33	<0.33
Methyl acetate	ug/L	--		<1.9	<0.58	<0.58	NA	<0.58	NA	<0.58	<0.58
Methylcyclohexane	ug/L	--		0.44 J	0.5 J	0.27 J	NA	<0.09	NA	<0.09	<0.09
Methylene Chloride	ug/L	940	(c)	<0.73	0.23 J	<0.21	NA	<0.22	NA	<0.22	<0.22
Styrene	ug/L	32	(c)	<0.27	<0.28	<0.17	NA	<0.28	NA	<0.28	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.4	<0.14	<0.12	NA	<0.14	NA	<0.14	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.65	<0.23	<0.18	NA	<0.23	NA	<0.23	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.19	<0.17	<0.19	NA	<0.17	NA	<0.17	<0.17
Trichloroethene	ug/L	47	(c)	<0.22	<0.2	<0.22	NA	<0.2	NA	<0.2	<0.2
Trichlorofluoromethane	ug/L	--		<0.43	<0.21	<0.15 J	NA	<0.21	NA	<0.21	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.15	<0.18	<0.06	NA	<0.18	NA	<0.18	<0.18
Benzene	ug/L	114	(c)	2.9	2.9	3.1	NA	<0.2	NA	<0.2	<0.2
Toluene	ug/L	253	(c)	<0.16	<0.17	<0.25	NA	<0.17	NA	<0.17	<0.17
Ethylbenzene	ug/L	14	(c)	<0.27	<0.19	<0.3	NA	<0.19	NA	<0.19	<0.19
Xylenes (total)	ug/L	27	(c)	<0.17	<0.58	<0.28	NA	<0.58	NA	<0.58	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.24	<0.17	<0.13	NA	<0.17	NA	<0.17	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	<0.35 J	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	NA	<0.01	NA	<0.01	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.21	<0.2	<0.27	NA	<0.2	NA	<0.2	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	4.3 J	1.3	NA	<0.27	NA	<0.27	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.8	NA	NA	<0.71	NA	<0.74	<0.71
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.9	NA	NA	<1.8	NA	<1.8	<1.7
2,4,5-Trichlorophenol	ug/L	--		NA	<7.1	NA	NA	<1.8	NA	<1.9	<1.8
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.8	NA	NA	<1.7	NA	<1.8	<1.7
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.6	NA	NA	<1.4	NA	<1.5	<1.4
2,4-Dimethylphenol	ug/L	100	(c)	NA	<4.2	NA	NA	<1.1	NA	<1.1	<1.1
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.9	NA	NA	<1.5	NA	<1.6	<1.5
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3.2	NA	NA	<0.82	NA	<0.84	<0.81
2,6-Dinitrotoluene	ug/L	--		NA	<2.3	NA	NA	<0.59	NA	<0.61	<0.58
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.8	NA	NA	<0.71	NA	<0.74	<0.71
2-Chlorophenol	ug/L	24	(c)	NA	<4.8	NA	NA	<1.2	NA	<1.3	<1.2
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.4	NA	NA	<0.1	NA	<0.11	<0.1
2-Methylphenol	ug/L	--		NA	<2.3	NA	NA	<0.59	NA	<0.61	<0.58
2-Nitroaniline	ug/L	--		NA	<3.7	NA	NA	<0.94	NA	<0.97	<0.93
2-Nitrophenol	ug/L	--		NA	<5.3	NA	NA	<1.4	NA	<1.4	<1.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.3	NA	NA	<0.84	NA	<0.87	<0.83
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2.2	NA	NA	<0.56	NA	<0.58	<0.56
3-Nitroaniline	ug/L	--		NA	<2.7	NA	NA	<0.69	NA	<0.71	<0.68
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<9.3	NA	NA	<2.4	NA	<2.4	<2.3
4-Bromophenyl-phenylether	ug/L	--		NA	<2.7	NA	NA	<0.69	NA	<0.71	<0.68
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.5	NA	NA	<1.1	NA	<1.2	<1.1

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-11R -- 42115.00 OB-11R-042115	OB-11R -- 42222.00 OB-11R-080615	OB-11R -- 42353.00 OB-11R-121515	OB-12 -- 41897.00 OB-12(091514)	OB-12 -- 42226.00 OB-12-081015	OB-13 -- 41890.00 OB-13(090814)	OB-13 -- 42226.00 DUP-02-081015	OB-13 -- 42226.00 OB-13-081015
4-Chloroaniline	ug/L	--		NA	<4.2	NA	NA	<1.1	NA	<1.1	<1.1
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.8	NA	NA	<0.71	NA	<0.74	<0.71
4-Nitroaniline	ug/L	--		NA	<3.1	NA	NA	<0.79	NA	<0.82	<0.78
4-Nitrophenol	ug/L	60	(c)	NA	<5.4	NA	NA	<1.4	NA	<1.4	<1.4
Acenaphthene	ug/L	38	(c)	NA	<0.32	NA	NA	<0.082	NA	<0.084	<0.081
Acenaphthylene	ug/L	4840	(c)	NA	<0.35	NA	NA	<0.089	NA	<0.092	<0.088
Acetophenone	ug/L	--		NA	<2.3	NA	NA	<0.59	NA	<0.61	<0.58
Anthracene	ug/L	0.035	(c)	NA	<0.38	NA	NA	<0.097	NA	<0.1	<0.096
Atrazine	ug/L	--		NA	<2.9	NA	NA	<0.74	NA	<0.76	<0.73
Benzaldehyde	ug/L	--		NA	<5.7	NA	NA	<1.5	NA	<1.5	<1.4
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	NA	<0.025	NA	<0.025	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	NA	<0.025	NA	<0.025	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	NA	<0.025	NA	<0.025	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.62	NA	NA	<0.16	NA	<0.16	<0.16
Benzo(k)fluoranthene	ug/L	--		NA	<0.37	NA	NA	<0.094	NA	<0.097	<0.093
bis(2-Chloroethoxy)methane	ug/L	--		NA	<3.1	NA	NA	<0.79	NA	<0.82	<0.78
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.8	NA	NA	<0.71	NA	<0.74	<0.71
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<6	NA	NA	3.7 B	NA	3.6 B	3.1 B
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.5	NA	NA	<0.64	NA	<0.66	<0.63
Caprolactam	ug/L	--		NA	<2.4	NA	NA	<0.61	NA	<0.63	<0.61
Carbazole	ug/L	--		NA	<2.8	NA	NA	<0.71	NA	<0.74	<0.71
Chrysene	ug/L	--		NA	<0.33	NA	NA	<0.084	NA	<0.087	<0.083
Cyclohexane	ug/L	--		2.2 J	1.9 J	2.2 J	NA	<0.13	NA	<0.13	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.45	NA	NA	<0.11	NA	<0.12	<0.11
Dibenzofuran	ug/L	--		NA	<2.9	NA	NA	<0.74	NA	<0.76	<0.73
Diethylphthalate	ug/L	110	(c)	NA	<3	NA	NA	<0.77	NA	<0.79	<0.76
Dimethylphthalate	ug/L	--		NA	<3.1	NA	NA	<0.79	NA	<0.82	<0.78
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.5	NA	2.2	<0.64	NA	<0.66	<0.63
Di-n-Octylphthalate	ug/L	--		NA	<2.5	NA	NA	<0.64	NA	<0.66	<0.63
Diphenyl ether	ug/L	--		NA	<2.2	NA	NA	<0.56	NA	<0.58	<0.56
Fluoranthene	ug/L	1.9	(c)	NA	<0.32	NA	NA	<0.082	NA	<0.084	<0.081
Fluorene	ug/L	19	(c)	NA	<0.32	NA	NA	<0.082	NA	<0.084	<0.081
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	NA	<0.014	NA	<0.014	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	NA	<0.2	NA	<0.2	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.8	NA	NA	<0.46	NA	<0.47	<0.45
Hexachloroethane	ug/L	8	(c)	NA	<1.9	NA	NA	<0.48	NA	<0.5	<0.48
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.41	NA	NA	<0.1	NA	<0.11	<0.1
Isophorone	ug/L	920	(c)	NA	<3.1	NA	NA	<0.79	NA	<0.82	<0.78
Naphthalene	ug/L	13	(c)	NA	<0.37	NA	NA	<0.094	NA	<0.097	<0.093
Nitrobenzene	ug/L	220	(c)	NA	<2.7	NA	NA	<0.69	NA	<0.71	<0.68
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	NA	<0.2	NA	<0.2	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.4	NA	NA	<0.87	NA	<0.89	<0.86
N-Nitrosodiphenylamine	ug/L	--		NA	<3.6	NA	NA	<0.92	NA	<0.95	<0.91

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Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-11R -- 42115.00 OB-11R-042115	OB-11R -- 42222.00 OB-11R-080615	OB-11R -- 42353.00 OB-11R-121515	OB-12 -- 41897.00 OB-12(091514)	OB-12 -- 42226.00 OB-12-081015	OB-13 -- 41890.00 OB-13(090814)	OB-13 -- 42226.00 DUP-02-081015	OB-13 -- 42226.00 OB-13-081015
Pentachlorophenol	ug/L	--		NA	<0.1	NA	NA	<0.1	NA	<0.1	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	<0.42	NA	NA	<0.11	NA	<0.11	<0.11
Phenol	ug/L	180	(c)	NA	<1.5	NA	NA	<0.38	NA	<0.39	<0.38
Pyrene	ug/L	0.3	(c)	NA	<0.35	NA	NA	<0.089	NA	<0.092	<0.088
Inorganics											
Aluminum	ug/L	87	(i)	NA	72.0	NA	NA	21.0	NA	19.0 J	20.0
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Arsenic	ug/L	150	(d) (e)	NA	25.0	NA	NA	<0.500	NA	<0.500	<0.500
Barium	ug/L	220	(c)	NA	98.0	NA	3.00	3.00	4.80	4.90	4.60
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	<0.400	NA	<0.400	<0.400
Calcium	ug/L	--	(j)	56,300	60,200	NA	9,110	9,800	6,760	8,200	7,900
Chromium	ug/L	42	(c)	NA	0.560 J	NA	NA	0.560 J	NA	<0.500	<0.500
Cobalt	ug/L	24	(c)	NA	2.20	NA	NA	<0.500	NA	<0.500	<0.500
Copper	ug/L	5.56	(a)	NA	<0.500	NA	4.00	4.60	NA	<0.500	<0.500
Iron	ug/L	--	(j)	70,000	70,400	NA	33.5	61.0	56.8	20.0 J	20.0 J
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	<0.200	NA	<0.200	<0.200
Magnesium	ug/L	--	(j)	7,150	7,400	NA	3,480	3,700	2,640	3,200	3,000
Manganese	ug/L	120	(i)	NA	11,900	11,100	1.10	1.90 J	8.20	4.90	4.50
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	<0.150	NA	<0.150	<0.150
Nickel	ug/L	31.24	(a)	NA	0.860 J	NA	NA	<0.500	NA	<0.500	0.610 J
Potassium	ug/L	--	(j)	NA	2,800	NA	737	610 J	1,040	1,200	1,100
Selenium	ug/L	5	(d)	NA	<0.600	NA	NA	<0.600	NA	<0.600	<0.600
Silver	ug/L	0.12	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Sodium	ug/L	--	(j)	<10,000	3,700	NA	2,730	3,200	2,770	3,200	3,200
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	<0.200	NA	<0.200	<0.200
Vanadium	ug/L	12	(c)	NA	<1.70 B	NA	NA	<1.10 B	NA	<1.50 B	<1.40 B
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	NA	<10.0	7.80	<10.0	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.60	NA	NA	14.0 J	NA	9.80 J	<9.60
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Arsenic	ug/L	150	(d) (e)	NA	<0.890 B	NA	NA	<0.500	NA	<0.500	<0.500
Barium	ug/L	220	(c)	NA	44.0	NA	3.00	2.80	4.70	4.50	4.50
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	<0.400	NA	<0.400	<0.400
Calcium	ug/L	--	(j)	55,400	55,800	NA	9,110	9,500	6,320	7,700	7,600
Chromium	ug/L	42	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Cobalt	ug/L	24	(c)	NA	1.70 J	NA	NA	<0.500	NA	<0.500	<0.500
Copper	ug/L	5.56	(a)	NA	<0.500	NA	4.60	4.10	1.80	<0.500	<0.500
Iron	ug/L	--	(j)	68,800	5,400	NA	16.9	14.0 J	14.7	<10.0	<10.0
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	<0.200	NA	<0.200	<0.200
Magnesium	ug/L	--	(j)	7,100	7,400	NA	3,530	3,500	2,480	3,000	2,900
Manganese	ug/L	120	(i)	NA	11,900	NA	0.900	1.30 J	4.10	3.50	2.90

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Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-11R	OB-11R	OB-11R	OB-12	OB-12	OB-13	OB-13	OB-13
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42115.00	42222.00	42353.00	41897.00	42226.00	41890.00	42226.00	42226.00
Sample Name:	Units	Chronic	Note	OB-11R-042115	OB-11R-080615	OB-11R-121515	OB-12(091514)	OB-12-081015	OB-13(090814)	DUP-02-081015	OB-13-081015
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	<0.150	NA	<0.150	<0.150
Nickel	ug/L	31.24	(a)	NA	900	NA	NA	<0.500	NA	0.700 J	<0.500
Potassium	ug/L	--	(j)	NA	2,600	NA	656	610 J	926	1,100	1,100
Selenium	ug/L	5	(d)	NA	<0.600	NA	NA	<0.600	NA	<0.600	<0.600
Silver	ug/L	0.12	(c)	NA	<0.500	NA	NA	<0.500	NA	<0.500	<0.500
Sodium	ug/L	--	(j)	<10,000	3,500	NA	2,710	3,200	2,600	3,400	3,000
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	<0.200	NA	<0.200	<0.200
Vanadium	ug/L	12	(c)	NA	<1.20 B	NA	NA	<0.960 B	NA	<1.30 B	<1.30 B
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	NA	<10.0	9.20	<10.0	<10.0
Miscellaneous											
Alkalinity	ug/L	--		NA	241,000	208,000	20,500	17,200	38,400	22,900	24,400
Alkalinity, Bicarbonate	ug/L	--		205,000	241,000	NA	NA	17,200	NA	22,900	24,400
Alkalinity, Carbonate	ug/L	--		205,000	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	<81	NA	NA	NA	NA	NA
Chloride	ug/L	--		2,100 B	5,370	<30	NA	1,220	2,900	2,730	2,750
Cyanide	ug/L	--		NA	<7	NA	NA	<7	NA	<7	<7
Fluoride, Total	ug/L	--		NA	NA	<15	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	7,500	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		<100	NA	<21	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	<21	NA	NA	NA	NA	NA
Nitrite	ug/L	--		<10	NA	<29	NA	NA	NA	NA	NA
Sulfate	ug/L	--		<10,000	<600	<110	17,300	15,300	NA	7,340	7,650
Sulfide	ug/L	--		NA	NA	<820	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		116,000	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	900	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	3,100	NA	NA	NA	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-14A / -- / 41885.00 / OB-14A(090314)	OB-14A / -- / 41893.00 / OB-14A(091114)	OB-14A / -- / 42229.00 / OB-14A-081315	OB-14B / -- / 41893.00 / OB-14B(091114)	OB-14B / -- / 42229.00 / OB-14B-081315	OB-15B / -- / 41887.00 / OB-15B(090514)	OB-15B / -- / 42240.00 / OB-15B-082415	OB-16 / -- / 41892.00 / OB-16(091014)
PCBs											
Aroclor-1016	ug/L	--		NA	NA	<0.43	NA	<0.43	NA	<0.37	NA
Aroclor-1221	ug/L	--		NA	NA	<0.34	NA	<0.34	NA	<0.29	NA
Aroclor-1232	ug/L	--		NA	NA	<0.4	NA	<0.4	NA	<0.34	NA
Aroclor-1242	ug/L	--		NA	NA	<0.22	NA	<0.22	NA	<0.19	NA
Aroclor-1248	ug/L	--		NA	NA	<0.15	NA	<0.15	NA	<0.13	NA
Aroclor-1254	ug/L	--		NA	NA	<0.17	NA	<0.17	NA	<0.15	NA
Aroclor-1260	ug/L	--		NA	NA	<0.18	NA	<0.18	NA	<0.16	NA
Total PCBs	ug/L	--		NA	NA	<0.43	NA	<0.43	NA	<0.37	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	NA	<0.15	NA	<0.15	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	NA	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		NA	NA	<0.24	NA	<0.24	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	NA	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	<2.1	NA	<2.1	NA	<1.8	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		NA	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	NA	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	NA	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	NA	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	NA	NA	<0.18	NA	<0.18	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
2-Butanone	ug/L	--		NA	NA	<2.6	NA	<2.6	NA	<2.6	NA
2-Hexanone	ug/L	--		NA	NA	<1.3	NA	<1.3	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		NA	NA	<0.81	NA	<0.81	NA	<0.81	NA
Acetone	ug/L	--		NA	NA	<2.7	NA	<2.7	NA	<2.7	NA
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Bromoform	ug/L	230	(c)	NA	NA	<0.29	NA	<0.29	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	NA	NA	<0.35 J	NA	<0.35 J	NA	<0.35	NA
Carbon Disulfide	ug/L	--		NA	NA	<0.22	NA	<0.22	NA	<0.22	NA
Carbon Tetrachloride	ug/L	240	(c)	NA	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	NA	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chloroethane	ug/L	--		NA	NA	<0.36	NA	<0.36	NA	<0.36	NA
Chloroform	ug/L	140	(c)	NA	NA	<0.23	NA	<0.23	NA	<0.23	NA
Chloromethane	ug/L	--		NA	NA	<0.36	NA	<0.36	NA	<0.36 J	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	NA	<0.21	NA	<0.21	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	NA	<0.25	NA	<0.25	NA	<0.25	NA

ED_001829_00000091-00089

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-14A - - 41885.00 OB-14A(090314)	OB-14A - - 41893.00 OB-14A(091114)	OB-14A - - 42229.00 OB-14A-081315	OB-14B - - 41893.00 OB-14B(091114)	OB-14B - - 42229.00 OB-14B-081315	OB-15B - - 41887.00 OB-15B(090514)	OB-15B - - 42240.00 OB-15B-082415	OB-16 - - 41892.00 OB-16(091014)
Dichlorodifluoromethane	ug/L	--		NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Isopropylbenzene	ug/L	--		NA	NA	<0.33	NA	<0.33	NA	<0.33	NA
Methyl acetate	ug/L	--		NA	NA	<0.58	NA	<0.58	NA	<0.58 J	NA
Methylcyclohexane	ug/L	--		NA	NA	<0.09	NA	<0.09	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	NA	NA	<0.22	NA	<0.22	NA	<0.22	NA
Styrene	ug/L	32	(c)	NA	NA	<0.28	NA	<0.28	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	NA	NA	<0.14	NA	<0.14	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	NA	<0.23	NA	<0.23	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	NA	NA	<0.2	NA	<0.2	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		NA	NA	<0.21	NA	<0.21	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	NA	NA	<0.18	NA	<0.18	NA	<0.18	NA
Benzene	ug/L	114	(c)	NA	NA	<0.2	NA	<0.2	NA	<0.2	NA
Toluene	ug/L	253	(c)	NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Ethylbenzene	ug/L	14	(c)	NA	NA	<0.19	NA	<0.19	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	NA	NA	<0.58	NA	<0.58	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	NA	NA	<0.17	NA	<0.17	NA	<0.17	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	NA	NA	<0.27	NA	<0.27	NA	<0.27	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	<2.8	NA	<2.8	NA	<2.4 J	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	<6.9	NA	<6.9	NA	<5.9	NA
2,4,5-Trichlorophenol	ug/L	--		NA	NA	<7.1	NA	<7.1	NA	<6.1	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	<6.8	NA	<6.8	NA	<5.9	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	<5.6	NA	<5.6	NA	<4.8	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	<4.2	NA	<4.2	NA	<3.6	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	<5.9	NA	<5.9	NA	<5.1	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	<3.2	NA	<3.2	NA	<2.8	NA
2,6-Dinitrotoluene	ug/L	--		NA	NA	<2.3	NA	<2.3	NA	<2	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	<2.8	NA	<2.8	NA	<2.4	NA
2-Chlorophenol	ug/L	24	(c)	NA	NA	<4.8	NA	<4.8	NA	<4.1	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	<0.4	NA	<0.4	NA	<0.34	NA
2-Methylphenol	ug/L	--		NA	NA	<2.3	NA	<2.3	NA	<2	NA
2-Nitroaniline	ug/L	--		NA	NA	<3.7	NA	<3.7	NA	<3.2	NA
2-Nitrophenol	ug/L	--		NA	NA	<5.3	NA	<5.3	NA	<4.6	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	<3.3	NA	<3.3	NA	<2.8	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	<2.2	NA	<2.2	NA	<1.9	NA
3-Nitroaniline	ug/L	--		NA	NA	<2.7	NA	<2.7	NA	<2.3	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	<9.3	NA	<9.3	NA	<8	NA
4-Bromophenyl-phenylether	ug/L	--		NA	NA	<2.7	NA	<2.7	NA	<2.3	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	<4.5	NA	<4.5	NA	<3.9	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-14A	OB-14A	OB-14A	OB-14B	OB-14B	OB-15B	OB-15B	OB-16
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41885.00	41893.00	42229.00	41893.00	42229.00	41887.00	42240.00	41892.00
Sample Name:	Units	Chronic	Note	OB-14A(090314)	OB-14A(091114)	OB-14A-081315	OB-14B(091114)	OB-14B-081315	OB-15B(090514)	OB-15B-082415	OB-16(091014)
4-Chloroaniline	ug/L	--		NA	NA	<4.2	NA	<4.2	NA	<3.6	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	<2.8	NA	<2.8	NA	<2.4	NA
4-Nitroaniline	ug/L	--		NA	NA	<3.1	NA	<3.1	NA	<2.7	NA
4-Nitrophenol	ug/L	60	(c)	NA	NA	<5.4	NA	<5.4	NA	<4.7	NA
Acenaphthene	ug/L	38	(c)	0.145	0.17	<0.32	NA	<0.32	NA	<0.28	NA
Acenaphthylene	ug/L	4840	(c)	NA	NA	<0.35	NA	<0.35	NA	<0.3	NA
Acetophenone	ug/L	--		NA	NA	<2.3	NA	<2.3	NA	<2	NA
Anthracene	ug/L	0.035	(c)	NA	NA	<0.38	NA	<0.38	NA	<0.33	NA
Atrazine	ug/L	--		NA	NA	<2.9	NA	<2.9	NA	<2.5	NA
Benzaldehyde	ug/L	--		NA	NA	<5.7	NA	<5.7	NA	<4.9	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	<0.025	NA	<0.025	NA	<0.023	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	<0.025	NA	<0.025	NA	<0.023	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	<0.025	NA	<0.025	NA	<0.023	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	<0.62	NA	<0.62	NA	<0.53	NA
Benzo(k)fluoranthene	ug/L	--		NA	NA	<0.37	NA	<0.37	NA	<0.32	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	<3.1	NA	<3.1	NA	<2.7	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	<2.8	NA	<2.8	NA	<2.4	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	NA	<6	NA	<6	NA	<5.2	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	<2.5	NA	<2.5	NA	<2.2	NA
Caprolactam	ug/L	--		NA	NA	<2.4	NA	<2.4	NA	<2.1	NA
Carbazole	ug/L	--		NA	NA	<2.8	NA	<2.8	NA	<2.4	NA
Chrysene	ug/L	--		NA	NA	<0.33	NA	<0.33	NA	<0.28	NA
Cyclohexane	ug/L	--		NA	NA	<0.13	NA	<0.13	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	<0.45	NA	<0.45	NA	<0.39	NA
Dibenzofuran	ug/L	--		NA	NA	<2.9	NA	<2.9	NA	<2.5	NA
Diethylphthalate	ug/L	110	(c)	NA	NA	<3	NA	<3	NA	<2.6	NA
Dimethylphthalate	ug/L	--		NA	NA	<3.1	NA	<3.1	NA	<2.7	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	3.5	1	<2.5	NA	<2.5	NA	<2.2	NA
Di-n-Octylphthalate	ug/L	--		NA	NA	<2.5	NA	<2.5	NA	<2.2	NA
Diphenyl ether	ug/L	--		NA	NA	<2.2	NA	<2.2	NA	<1.9	NA
Fluoranthene	ug/L	1.9	(c)	NA	NA	<0.32	NA	<0.32	NA	<0.28	NA
Fluorene	ug/L	19	(c)	NA	0.129	<0.32	NA	<0.32	NA	<0.28	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	<0.014	NA	<0.014	NA	<0.013	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	<0.2	NA	<0.2	NA	<0.19	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	<1.8	NA	<1.8	NA	<1.6	NA
Hexachloroethane	ug/L	8	(c)	NA	NA	<1.9	NA	<1.9	NA	<1.6	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	<0.41	NA	<0.41	NA	<0.35	NA
Isophorone	ug/L	920	(c)	NA	NA	<3.1	NA	<3.1	NA	<2.7	NA
Naphthalene	ug/L	13	(c)	NA	NA	<0.37	NA	<0.37	NA	<0.32	NA
Nitrobenzene	ug/L	220	(c)	NA	NA	<2.7	NA	<2.7	NA	<2.3	NA
N-Nitrosodimethylamine	ug/L	--		NA	NA	<0.2	NA	<0.2	NA	<0.19	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	<3.4	NA	<3.4	NA	<2.9	NA
N-Nitrosodiphenylamine	ug/L	--		0.51	NA	<3.6	NA	<3.6	NA	<3.1	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-14A	OB-14A	OB-14A	OB-14B	OB-14B	OB-15B	OB-15B	OB-16
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41885.00	41893.00	42229.00	41893.00	42229.00	41887.00	42240.00	41892.00
Sample Name:	Units	Chronic	Note	OB-14A(090314)	OB-14A(091114)	OB-14A-081315	OB-14B(091114)	OB-14B-081315	OB-15B(090514)	OB-15B-082415	OB-16(091014)
Pentachlorophenol	ug/L	--		NA	NA	<0.1	NA	<0.1	NA	<0.093	NA
Phenanthrene	ug/L	3.6	(c)	NA	NA	<0.42	NA	<0.42	NA	<0.36	NA
Phenol	ug/L	180	(c)	NA	NA	<1.5	NA	<1.5	NA	<1.3	NA
Pyrene	ug/L	0.3	(c)	NA	NA	<0.35	NA	<0.35	NA	<0.3	NA
Inorganics											
Aluminum	ug/L	87	(i)	136	94.4	25.0	207	<9.60	626	890	NA
Antimony	ug/L	80	(c)	NA	NA	0.610 J	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	NA	4.80	9.20	NA	2.50	NA	1.40 J	4.70
Barium	ug/L	220	(c)	428	482	460	47.7	41.0	41.9	41.0	94.3
Beryllium	ug/L	3.6	(c)	NA	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	115,000	120,000	146,000	105,000	125,000	23,900	23,000	130,000
Chromium	ug/L	42	(c)	NA	2.00	0.770 J	NA	0.550 J	2.90	2.20	NA
Cobalt	ug/L	24	(c)	NA	NA	1.20 J	NA	<0.500	NA	0.820 J	2.00
Copper	ug/L	5.56	(a)	NA	NA	<0.500	NA	<0.500	NA	1.90 J	NA
Iron	ug/L	--	(j)	44,400	48,800	59,300	756	930	1,130	1,600	9,920
Lead	ug/L	5.4	(d) (e)	NA	NA	0.860 J	NA	<0.200	1.40	<0.630 B	1.30
Magnesium	ug/L	--	(j)	9,740	10,700	10,900	30,700	28,800	6,070	5,800	18,000
Manganese	ug/L	120	(i)	931	1,190	1,500	1,860	1,600	4,720	4,000	3,780
Mercury	ug/L	0.77	(d) (e)	NA	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	1.70	1.00	2.60	NA	1.90 J	19.8	15.0	2.00
Potassium	ug/L	--	(j)	4,940	5,670	5,800	3,150	3,100	934	900 J	10,800
Selenium	ug/L	5	(d)	NA	NA	<0.600	NA	<0.600	6.20	<0.600	NA
Silver	ug/L	0.12	(c)	1.70	6.20	<0.500	3.40	<0.500	NA	<0.500	NA
Sodium	ug/L	--	(j)	17,500	19,400	18,400	21,600	18,400	4,120	4,000	34,600
Thallium	ug/L	10	(c)	NA	NA	<0.200	NA	<0.200	NA	<1.10 B	NA
Vanadium	ug/L	12	(c)	3.40	1.60	4.00 B	NA	2.40 B	5.50	5.40	2.70
Zinc	ug/L	71.69	(a)	NA	8.70	<10.0	NA	<10.0	NA	<10.0	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	79.2	71.5	<9.60	62.8	<9.60	NA	170	NA
Antimony	ug/L	80	(c)	NA	NA	0.740 J	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	NA	3.50	1.20 J	NA	1.10 J	NA	1.10 J	NA
Barium	ug/L	220	(c)	351	383	310	44.5	41.0	NA	1.60 J	68.9
Beryllium	ug/L	3.6	(c)	NA	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	111,000	120,000	115,000	101,000	100,000	23,000	21,700	121,000
Chromium	ug/L	42	(c)	NA	1.50	<0.500	NA	<0.500	NA	<0.500	NA
Cobalt	ug/L	24	(c)	NA	NA	0.880 J	NA	<0.500	NA	<0.500	1.70
Copper	ug/L	5.56	(a)	NA	NA	<0.500	NA	<0.500	NA	<0.500	NA
Iron	ug/L	--	(j)	28,800	34,200	27,300	133	50.0	NA	210	4,490
Lead	ug/L	5.4	(d) (e)	NA	NA	<0.200	NA	<0.200	NA	<0.200	1.80
Magnesium	ug/L	--	(j)	9,440	11,100	10,200	29,800	29,900	5,750	5,700	17,300
Manganese	ug/L	120	(i)	892	1,380	1,800	1,800	3,300	361	420	3,570

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Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-14A	OB-14A	OB-14A	OB-14B	OB-14B	OB-15B	OB-15B	OB-16
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41885.00	41893.00	42229.00	41893.00	42229.00	41887.00	42240.00	41892.00
Sample Name:	Units	Chronic	Note	OB-14A(090314)	OB-14A(091114)	OB-14A-081315	OB-14B(091114)	OB-14B-081315	OB-15B(090514)	OB-15B-082415	OB-16(091014)
Mercury	ug/L	0.77	(d) (e)	NA	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	2.50	1.70	1.30 J	3.00	1.20 J	NA	1.20 J	1.60
Potassium	ug/L	--	(j)	4,800	5,860	5,100	3,050	2,900	724	740 J	9,960
Selenium	ug/L	5	(d)	6.70	NA	<0.600	NA	<0.600	5.00	<0.600	NA
Silver	ug/L	0.12	(c)	NA	6.80	<0.500	2.70	<0.500	NA	<0.500	NA
Sodium	ug/L	--	(j)	16,900	20,300	17,500	21,100	19,400	4,040	3,900	32,800
Thallium	ug/L	10	(c)	NA	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	NA	<1.70 B	NA	<1.60 B	NA	2.40 B	2.00
Zinc	ug/L	71.69	(a)	NA	15.5	<10.0	14.9	<10.0	NA	<10.0	8.10
Miscellaneous											
Alkalinity	ug/L	--		387,000	356,000	377,000	359,000	311,000	86,600	66,900	431,000
Alkalinity, Bicarbonate	ug/L	--		NA	NA	377,000	NA	311,000	NA	66,900	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		26,400	27,500	20,600	52,000	45,100	NA	1,530	46,500
Cyanide	ug/L	--		NA	NA	<7	NA	<7	NA	9.8 J	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		NA	NA	<600	NA	13,400	12,500	10,800	NA
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-16	OB-17	OB-17	OB-18	OB-18	OB-19	OB-19	OB-19
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42229.00	41885.00	42229.00	41885.00	42229.00	41886.00	42221.00	42353.00
Sample Name:	Units	Chronic	Note	OB-16-081315	OB-17(090314)	OB-17-081315	OB-18(09032014)	OB-18-081315	OB-19(090414)	OB-19-080515	OB-19-121515
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	<0.43	NA	<0.43	NA	<0.43	NA
Aroclor-1221	ug/L	--		<0.34	NA	<0.34	NA	<0.34	NA	<0.34	NA
Aroclor-1232	ug/L	--		<0.4	NA	<0.4	NA	<0.4	NA	<0.4	NA
Aroclor-1242	ug/L	--		<0.22	NA	<0.22	NA	<0.22	NA	<0.22	NA
Aroclor-1248	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	<0.15	NA
Aroclor-1254	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Aroclor-1260	ug/L	--		<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Total PCBs	ug/L	--		<0.43	NA	<0.43	NA	<0.43	NA	<0.5	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	<0.28
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	<0.15	<0.34
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	<0.08
1,1-Dichloroethane	ug/L	--		<0.24	0.94	0.78 J	NA	<0.24	NA	<0.24	0.27 J
1,1-Dichloroethene	ug/L	65	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	<0.34
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	NA	<2.1	NA	<2.1	NA	<2.1	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	<0.007
1,2-Dibromoethane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	<0.006
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	<0.22
1,2-Dichloroethane	ug/L	910	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	<0.25
1,2-Dichloropropane	ug/L	360	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	<0.18
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	<0.33
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.33
2-Butanone	ug/L	--		<2.6	NA	<2.6	NA	<2.6	NA	<2.6	<2.2
2-Hexanone	ug/L	--		<1.3	NA	<1.3	NA	<1.3	NA	<1.3	<0.72
4-Methyl-2-pentanone	ug/L	--		<0.81	NA	<0.81	NA	<0.81	NA	<0.81	<0.63
Acetone	ug/L	--		<2.7	NA	<2.7	NA	<2.7	NA	<2.7	<1.1
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<0.3
Bromodichloromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.15
Bromoform	ug/L	230	(c)	<0.29	NA	<0.29	NA	<0.29	NA	<0.29	<0.18
Bromomethane	ug/L	16	(c)	<0.35 J	NA	<0.35 J	NA	<0.35 J	NA	<0.35	<0.18
Carbon Disulfide	ug/L	--		<0.22	NA	<0.22	NA	<0.22	NA	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	<0.33
Chlorobenzene	ug/L	47	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	<0.24
Chloroethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36	NA	0.39 J	8.7
Chloroform	ug/L	140	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	<0.22
Chloromethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36	NA	<0.36	<0.22
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	NA	<0.21	NA	<0.21	NA	<0.21	<0.26
cis-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.16
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	NA	<0.25	NA	<0.25	NA	<0.25	<0.22

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-16	OB-17	OB-17	OB-18	OB-18	OB-19	OB-19	OB-19
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42229.00	41885.00	42229.00	41885.00	42229.00	41886.00	42221.00	42353.00
Sample Name:	Units	Chronic	Note	OB-16-081315	OB-17(090314)	OB-17-081315	OB-18(09032014)	OB-18-081315	OB-19(090414)	OB-19-080515	OB-19-121515
Dichlorodifluoromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.14
Isopropylbenzene	ug/L	--		<0.33	NA	<0.33	NA	<0.33	NA	<0.33	<0.32
Methyl acetate	ug/L	--		<0.58	NA	<0.58	NA	<0.58	NA	<0.58	<0.58
Methylcyclohexane	ug/L	--		<0.09	NA	<0.09	NA	<0.09	NA	<0.09	<0.22
Methylene Chloride	ug/L	940	(c)	<0.22	NA	<0.22	NA	<0.22	NA	<0.22	<0.21
Styrene	ug/L	32	(c)	<0.28	NA	<0.28	NA	<0.28	NA	<0.28	<0.17
Tetrachloroethene	ug/L	45	(c)	<0.14	NA	<0.14	NA	<0.14	NA	<0.14	<0.12
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	<0.18
trans-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.19
Trichloroethene	ug/L	47	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	<0.22
Trichlorofluoromethane	ug/L	--		<0.21	NA	<0.21	NA	<0.21	NA	<0.21	<0.15 J
Vinyl Chloride	ug/L	930	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	<0.06
Benzene	ug/L	114	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	1.4
Toluene	ug/L	253	(c)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.25
Ethylbenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	<0.3
Xylenes (total)	ug/L	27	(c)	<0.58	NA	<0.58	NA	<0.58	NA	<0.58	<0.28
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	<0.13
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<0.35 J
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	<0.27
1,4-Dioxane	ug/L	22000	(k)	<0.27	NA	17	NA	<0.27	NA	<0.27	1.89
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	NA	<2.8	NA	<2.8	NA	<2.8	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	NA	<6.9	NA	<6.9	NA	<6.9	NA
2,4,5-Trichlorophenol	ug/L	--		<7.1	NA	<7.1	NA	<7.1	NA	<7.1	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	NA	<6.8	NA	<6.8	NA	<6.8	NA
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	NA	<5.6	NA	<5.6	NA	<5.6	NA
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	NA	<4.2	NA	<4.2	NA	<4.2	NA
2,4-Dinitrophenol	ug/L	19	(c)	<5.9	NA	<5.9	NA	<5.9	NA	<5.9	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	NA	<3.2	NA	<3.2	NA	<3.2	NA
2,6-Dinitrotoluene	ug/L	--		<2.3	NA	<2.3	NA	<2.3	NA	<2.3	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	NA	<2.8	NA	<2.8	NA	<2.8	NA
2-Chlorophenol	ug/L	24	(c)	<4.8	NA	<4.8	NA	<4.8	NA	<4.8	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.4	NA	<0.4	NA	<0.4	NA	<0.4	NA
2-Methylphenol	ug/L	--		<2.3	NA	<2.3	NA	<2.3	NA	<2.3	NA
2-Nitroaniline	ug/L	--		<3.7	NA	<3.7	NA	<3.7	NA	<3.7	NA
2-Nitrophenol	ug/L	--		<5.3	NA	<5.3	NA	<5.3	NA	<5.3	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	NA	<3.3	NA	<3.3	NA	<3.3	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	NA	<2.2	NA	<2.2	NA	<2.2	NA
3-Nitroaniline	ug/L	--		<2.7	NA	<2.7	NA	<2.7	NA	<2.7	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	NA	<9.3	NA	<9.3	NA	<9.3	NA
4-Bromophenyl-phenylether	ug/L	--		<2.7	NA	<2.7	NA	<2.7	NA	<2.7	NA
4-Chloro-3-Methylphenol	ug/L	--		<4.5	NA	<4.5	NA	<4.5	NA	<4.5	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-16	OB-17	OB-17	OB-18	OB-18	OB-19	OB-19	OB-19
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				42229.00	41885.00	42229.00	41885.00	42229.00	41886.00	42221.00	42353.00
Sample Name:	Units	Chronic	Note	OB-16-081315	OB-17(090314)	OB-17-081315	OB-18(09032014)	OB-18-081315	OB-19(090414)	OB-19-080515	OB-19-121515
4-Chloroaniline	ug/L	--		<4.2	NA	<4.2	NA	<4.2	NA	<4.2	NA
4-Chlorophenyl-phenylether	ug/L	--		<2.8	NA	<2.8	NA	<2.8	NA	<2.8	NA
4-Nitroaniline	ug/L	--		<3.1	NA	<3.1	NA	<3.1	NA	<3.1	NA
4-Nitrophenol	ug/L	60	(c)	<5.4	NA	<5.4	NA	<5.4	NA	<5.4	NA
Acenaphthene	ug/L	38	(c)	<0.32	NA	<0.32	NA	<0.32	NA	<0.32	NA
Acenaphthylene	ug/L	4840	(c)	<0.35	NA	<0.35	NA	<0.35	NA	<0.35	NA
Acetophenone	ug/L	--		<2.3	NA	<2.3	NA	<2.3	NA	<2.3	NA
Anthracene	ug/L	0.035	(c)	<0.38	NA	<0.38	NA	<0.38	NA	<0.38	NA
Atrazine	ug/L	--		<2.9	NA	<2.9	NA	<2.9	NA	<2.9	NA
Benzaldehyde	ug/L	--		<5.7	NA	<5.7	NA	<5.7	NA	<5.7	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	<0.025	NA	<0.025	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	NA	<0.62	NA	<0.62	NA	<0.62	NA
Benzo(k)fluoranthene	ug/L	--		<0.37	NA	<0.37	NA	<0.37	NA	<0.37	NA
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	NA	<3.1	NA	<3.1	NA	<3.1	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	NA	<2.8	NA	<2.8	NA	<2.8	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	NA	<6	NA	<6	NA	<6	NA
Butylbenzylphthalate	ug/L	23	(c)	<2.5	NA	<2.5	NA	<2.5	NA	<2.5	NA
Caprolactam	ug/L	--		<2.4	NA	<2.4	NA	<2.4	NA	<2.4	NA
Carbazole	ug/L	--		<2.8	NA	<2.8	NA	<2.8	NA	<2.8	NA
Chrysene	ug/L	--		<0.33	NA	<0.33	NA	<0.33	NA	<0.33	NA
Cyclohexane	ug/L	--		<0.13	NA	<0.13	NA	<0.13	NA	<0.13	0.29 J
Dibenzo(a,h)anthracene	ug/L	--		<0.45	NA	<0.45	NA	<0.45	NA	<0.45	NA
Dibenzofuran	ug/L	--		<2.9	NA	<2.9	NA	<2.9	NA	<2.9	NA
Diethylphthalate	ug/L	110	(c)	<3	NA	<3	NA	<3	NA	<3	NA
Dimethylphthalate	ug/L	--		<3.1	NA	<3.1	NA	<3.1	NA	<3.1	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	3.6	<2.5	1.2	<2.5	NA	<2.5	NA
Di-n-Octylphthalate	ug/L	--		<2.5	NA	<2.5	NA	<2.5	NA	<2.5	NA
Diphenyl ether	ug/L	--		<2.2	NA	<2.2	NA	<2.2	NA	<2.2	NA
Fluoranthene	ug/L	1.9	(c)	<0.32	NA	<0.32	NA	<0.32	NA	<0.32	NA
Fluorene	ug/L	19	(c)	<0.32	NA	<0.32	NA	<0.32	NA	<0.32	NA
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	<0.014	NA	<0.014	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	NA	<1.8	NA	<1.8	NA	<1.8	NA
Hexachloroethane	ug/L	8	(c)	<1.9	NA	<1.9	NA	<1.9	NA	<1.9	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	NA	<0.41	NA	<0.41	NA	<0.41	NA
Isophorone	ug/L	920	(c)	<3.1	NA	<3.1	NA	<3.1	NA	<3.1	NA
Naphthalene	ug/L	13	(c)	<0.37	NA	<0.37	0.128	<0.37	NA	<0.37	NA
Nitrobenzene	ug/L	220	(c)	<2.7	NA	<2.7	NA	<2.7	NA	<2.7	NA
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	NA	<3.4	NA	<3.4	NA	<3.4	NA
N-Nitrosodiphenylamine	ug/L	--		<3.6	NA	<3.6	NA	<3.6	NA	<3.6	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-16	OB-17	OB-17	OB-18	OB-18	OB-19	OB-19	OB-19
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42229.00	41885.00	42229.00	41885.00	42229.00	41886.00	42221.00	42353.00
Sample Name:	Units	Chronic	Note	OB-16-081315	OB-17(090314)	OB-17-081315	OB-18(09032014)	OB-18-081315	OB-19(090414)	OB-19-080515	OB-19-121515
Pentachlorophenol	ug/L	--		<0.1	NA	<0.1	NA	<0.1	NA	R	NA
Phenanthrene	ug/L	3.6	(c)	<0.42	NA	<0.42	NA	<0.42	NA	<0.42	NA
Phenol	ug/L	180	(c)	<1.5	NA	<1.5	NA	<1.5	NA	<1.5	NA
Pyrene	ug/L	0.3	(c)	<0.35	NA	<0.35	NA	<0.35	NA	<0.35	NA
Inorganics											
Aluminum	ug/L	87	(i)	<9.60	104	51.0	157	270	65.0	71.0	NA
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	12.0	3.50	5.00 B	NA	1.40 J	6.00	<1.60 B	NA
Barium	ug/L	220	(c)	100	13.4	16.0	9.20	10.0	80.9	86.0	NA
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	170,000	104,000	110,000	53,000	54,700	14,600	13,100	NA
Chromium	ug/L	42	(c)	<0.500	NA	0.730 J	NA	1.20 J	1.40	0.950 J	NA
Cobalt	ug/L	24	(c)	1.90 J	NA	1.00 J	NA	<0.500	NA	<0.500	NA
Copper	ug/L	5.56	(a)	<0.500	NA	1.10 J	NA	<0.500	NA	7.50	NA
Iron	ug/L	--	(j)	20,100	4,300	6,100	151	360	25,500	16,500	NA
Lead	ug/L	5.4	(d) (e)	<0.200	NA	0.360 J	NA	<0.200	NA	0.440 J	NA
Magnesium	ug/L	--	(j)	18,200	31,600	31,000	11,000	10,800	2,590	2,500	NA
Manganese	ug/L	120	(i)	4,900	712	530	5.80	13.0	1,150	290	357
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	1.50 J	NA	1.40 J	NA	1.40 J	NA	2.00	NA
Potassium	ug/L	--	(j)	10,600	856	910 J	460	530 J	1,060	800 J	NA
Selenium	ug/L	5	(d)	<0.600	4.50	<0.600	NA	<0.600	NA	<0.600	NA
Silver	ug/L	0.12	(c)	<0.500	NA	<0.500	NA	<0.500	1.40	<0.500	NA
Sodium	ug/L	--	(j)	34,200	15,000	14,800	6,820	6,200	3,080	3,300	NA
Thallium	ug/L	10	(c)	<0.200	NA	0.660 J	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	2.50 B	NA	2.80 B	NA	2.60 B	2.40	4.10 B	NA
Zinc	ug/L	71.69	(a)	11.0 J	NA	<10.0	NA	<10.0	17.6	<10.0	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	<9.60	80.8	<9.60	NA	17.0 J	24.6	<9.60	NA
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	2.30	NA	0.580 J	NA	<0.500	NA	<0.870 B	NA
Barium	ug/L	220	(c)	69.0	11.3	13.0	8.30	8.90	66.9	76.0	NA
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	142,000	103,000	99,300	52,600	53,600	14,000	12,700	NA
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	NA	0.670 J	NA	<0.500	NA
Cobalt	ug/L	24	(c)	1.80 J	NA	0.880 J	NA	<0.500	NA	<0.500	NA
Copper	ug/L	5.56	(a)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Iron	ug/L	--	(j)	2,900	161	110	NA	18.0 J	13,900	4,700	NA
Lead	ug/L	5.4	(d) (e)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Magnesium	ug/L	--	(j)	18,000	31,700	31,600	11,000	11,000	2,480	2,400	NA
Manganese	ug/L	120	(i)	4,000	570	550	2.60	0.750 J	1,110	310	NA

ED_001829_00000091-00097

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-16	OB-17	OB-17	OB-18	OB-18	OB-19	OB-19	OB-19
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42229.00	41885.00	42229.00	41885.00	42229.00	41886.00	42221.00	42353.00
Sample Name:	Units	Chronic	Note	OB-16-081315	OB-17(090314)	OB-17-081315	OB-18(09032014)	OB-18-081315	OB-19(090414)	OB-19-080515	OB-19-121515
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	0.700 J	NA	0.630 J	NA	<0.500	NA	1.50 J	NA
Potassium	ug/L	--	(j)	10,500	826	810 J	391	390 J	993	790 J	NA
Selenium	ug/L	5	(d)	<0.600	4.90	<0.600	NA	<0.600	NA	0.690 J	NA
Silver	ug/L	0.12	(c)	<0.500	NA	<0.500	NA	<0.500	1.90	<0.500	NA
Sodium	ug/L	--	(j)	34,400	15,000	14,900	6,770	6,400	3,020	3,200	NA
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	<1.60 B	NA	<1.70 B	NA	<1.50 B	NA	<1.10 B	NA
Zinc	ug/L	71.69	(a)	<10.0	NA	<10.0	NA	<10.0	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		401,000	336,000	328,000	173,000	163,000	57,400	53,000	64,100
Alkalinity, Bicarbonate	ug/L	--		401,000	NA	328,000	NA	163,000	NA	53,000	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<81
Chloride	ug/L	--		56,600	11,600	8,570	NA	1,220	NA	1,210	1,810
Cyanide	ug/L	--		<7	NA	<7	NA	<7	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	63 J
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	9,500
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<21
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<21
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<29
Sulfate	ug/L	--		3,370	45,800	38,500	15,000	11,600	NA	1,140	3,100
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<820
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	1,000
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	2,700

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-20A / -- / 41887.00 / OB-20A(090514)	OB-20A / -- / 42115.00 / OB-20A-042115	OB-20A / -- / 42221.00 / OB-20A-080515	OB-20A / -- / 42352.00 / OB-20A-121415	OB-20B / -- / 41887.00 / OB-20B(090514)	OB-20B / -- / 41921.00 / DUP(100914)	OB-20B / -- / 41921.00 / OB-20B(100914)	OB-20B / -- / 42115.00 / OB-20B-042115
PCBs											
Aroclor-1016	ug/L	--		NA	NA	<0.43	NA	NA	NA	NA	NA
Aroclor-1221	ug/L	--		NA	NA	<0.34	NA	NA	NA	NA	NA
Aroclor-1232	ug/L	--		NA	NA	<0.4	NA	NA	NA	NA	NA
Aroclor-1242	ug/L	--		NA	NA	<0.22	NA	NA	NA	NA	NA
Aroclor-1248	ug/L	--		NA	NA	<0.15	NA	NA	NA	NA	NA
Aroclor-1254	ug/L	--		NA	NA	<0.17	NA	NA	NA	NA	NA
Aroclor-1260	ug/L	--		NA	NA	<0.18	NA	NA	NA	NA	NA
Total PCBs	ug/L	--		NA	NA	<0.5	NA	NA	NA	NA	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.25	<0.19	<0.28	NA	NA	NA	<0.25
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.21	<0.19	<0.19	NA	NA	NA	<0.21
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.52	<0.15	<0.34	NA	NA	NA	<0.52
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.21	<0.19	<0.08	NA	NA	NA	<0.21
1,1-Dichloroethane	ug/L	--		NA	<0.17	<0.24	<0.24	NA	NA	NA	<0.17
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.51	<0.25	<0.34	NA	NA	NA	<0.51
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	<2.1	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.99	<0.01	<0.007	NA	NA	NA	<0.99
1,2-Dibromoethane	ug/L	--		NA	<0.23	<0.01	<0.006	NA	NA	NA	<0.23
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	<0.19	<0.22	NA	NA	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.18	<0.2	<0.25	NA	NA	NA	<0.18
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.39	<0.25	<0.18	NA	NA	NA	<0.39
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.23	<0.18	<0.33	NA	NA	NA	<0.23
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	<0.27	<0.17	<0.33	NA	NA	NA	<0.27
2-Butanone	ug/L	--		NA	<5.6	<2.6	<2.2	NA	NA	NA	<5.6
2-Hexanone	ug/L	--		NA	<1.7	<1.3	<0.72	NA	NA	NA	<1.7
4-Methyl-2-pentanone	ug/L	--		NA	<1	<0.81	<0.63	NA	NA	NA	<1
Acetone	ug/L	--		NA	<3.3	<2.7	<1.1	NA	NA	NA	<3.3
Bromochloromethane	ug/L	--		NA	NA	NA	<0.3	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	<0.23	<0.17	<0.15	NA	NA	NA	<0.23
Bromoform	ug/L	230	(c)	NA	<0.23	<0.29	<0.18	NA	NA	NA	<0.23
Bromomethane	ug/L	16	(c)	NA	<0.42	<0.35	<0.18 J	NA	NA	NA	<0.42
Carbon Disulfide	ug/L	--		NA	<0.25	<0.22	<0.22	NA	NA	NA	<0.25
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.22	<0.18	<0.33	NA	NA	NA	<0.22
Chlorobenzene	ug/L	47	(c)	NA	<0.19	<0.18	<0.24	NA	NA	NA	<0.19
Chloroethane	ug/L	--		NA	<0.34	<0.36	<0.37 J	1.1	1.5	1.6	2.4
Chloroform	ug/L	140	(c)	NA	<0.19	<0.23	<0.22	NA	NA	NA	<0.19
Chloromethane	ug/L	--		NA	<0.41	0.37 J	<0.22	NA	NA	NA	<0.41
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.27	<0.21	<0.26	NA	NA	NA	<0.27
cis-1,3-Dichloropropene	ug/L	--		NA	<0.21	<0.17	<0.16	NA	NA	NA	<0.21
Cyclohexane	ug/L	--		NA	NA	NA	NA	0.7	0.84	0.89	NA
Dibromochloromethane	ug/L	--		NA	<0.15	<0.25	<0.22	NA	NA	NA	<0.15

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-20A - - 41887.00 OB-20A(090514)	OB-20A - - 42115.00 OB-20A-042115	OB-20A - - 42221.00 OB-20A-080515	OB-20A - - 42352.00 OB-20A-121415	OB-20B - - 41887.00 OB-20B(090514)	OB-20B - - 41921.00 DUP(100914)	OB-20B - - 41921.00 OB-20B(100914)	OB-20B - - 42115.00 OB-20B-042115
Dichlorodifluoromethane	ug/L	--		NA	<0.9	<0.17	<0.14	NA	NA	NA	<0.9
Isopropylbenzene	ug/L	--		NA	<0.23	<0.33	<0.32	0.37	0.54	0.56	<0.23
Methyl acetate	ug/L	--		NA	<1.9	<0.58	<0.58	NA	NA	NA	<1.9
Methylcyclohexane	ug/L	--		NA	<0.22	<0.09	<0.22	0.52	0.56	0.64	0.59 J
Methylene Chloride	ug/L	940	(c)	NA	<0.73	0.35 J	<0.21	NA	NA	NA	<0.73
Styrene	ug/L	32	(c)	NA	<0.27	<0.28	<0.17	NA	NA	NA	<0.27
Tetrachloroethene	ug/L	45	(c)	NA	<0.4	<0.14	<0.12	NA	NA	NA	<0.4
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.65	<0.23	<0.18	NA	NA	NA	<0.65
trans-1,3-Dichloropropene	ug/L	--		NA	<0.19	<0.17	<0.19	NA	NA	NA	<0.19
Trichloroethene	ug/L	47	(c)	NA	<0.22	<0.2	<0.22	NA	NA	NA	<0.22
Trichlorofluoromethane	ug/L	--		NA	<0.43	<0.21	<0.15	NA	NA	NA	<0.43
Vinyl Chloride	ug/L	930	(c)	NA	<0.15	<0.18	<0.06	NA	NA	NA	<0.15
Benzene	ug/L	114	(c)	NA	<0.24	<0.2	<0.09	0.37	0.4	0.4	0.36 J
Toluene	ug/L	253	(c)	NA	<0.16	<0.17	<0.25	NA	NA	NA	<0.16
Ethylbenzene	ug/L	14	(c)	NA	<0.27	<0.19	<0.3	NA	NA	NA	<0.27
Xylenes (total)	ug/L	27	(c)	NA	<0.17	<0.58	<0.28	0.39	0.56	0.61	<0.17
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.24	<0.17	<0.13	NA	NA	NA	<0.24
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	<0.35	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	<0.01	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.21	<0.2	<0.27	NA	NA	NA	<0.21
1,4-Dioxane	ug/L	22000	(k)	NA	NA	<0.27	<0.053	NA	NA	NA	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	<2.8	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	<6.9	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	ug/L	--		NA	NA	<7.1	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	<6.8	NA	NA	NA	NA	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	<5.6	NA	NA	NA	NA	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	<4.2	NA	NA	NA	NA	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	<5.9	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	<3.2	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	ug/L	--		NA	NA	<2.3	NA	NA	NA	NA	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	<2.8	NA	NA	NA	NA	NA
2-Chlorophenol	ug/L	24	(c)	NA	NA	<4.8	NA	NA	NA	NA	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	<0.4	NA	NA	NA	NA	NA
2-Methylphenol	ug/L	--		NA	NA	<2.3	NA	NA	NA	NA	NA
2-Nitroaniline	ug/L	--		NA	NA	<3.7	NA	NA	NA	NA	NA
2-Nitrophenol	ug/L	--		NA	NA	<5.3	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	<3.3	NA	NA	NA	NA	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	<2.2	NA	NA	NA	NA	NA
3-Nitroaniline	ug/L	--		NA	NA	<2.7	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	<9.3	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	ug/L	--		NA	NA	<2.7	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	<4.5	NA	NA	NA	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-20A -- 41887.00 OB-20A(090514)	OB-20A -- 42115.00 OB-20A-042115	OB-20A -- 42221.00 OB-20A-080515	OB-20A -- 42352.00 OB-20A-121415	OB-20B -- 41887.00 OB-20B(090514)	OB-20B -- 41921.00 DUP(100914)	OB-20B -- 41921.00 OB-20B(100914)	OB-20B -- 42115.00 OB-20B-042115
4-Chloroaniline	ug/L	--		NA	NA	<4.2	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	<2.8	NA	NA	NA	NA	NA
4-Nitroaniline	ug/L	--		NA	NA	<3.1	NA	NA	NA	NA	NA
4-Nitrophenol	ug/L	60	(c)	NA	NA	<5.4	NA	NA	NA	NA	NA
Acenaphthene	ug/L	38	(c)	0.131	NA	<0.32	NA	NA	0.125	0.12	NA
Acenaphthylene	ug/L	4840	(c)	NA	NA	<0.35	NA	NA	NA	NA	NA
Acetophenone	ug/L	--		NA	NA	<2.3	NA	NA	NA	NA	NA
Anthracene	ug/L	0.035	(c)	NA	NA	<0.38	NA	NA	NA	NA	NA
Atrazine	ug/L	--		NA	NA	<2.9	NA	NA	NA	NA	NA
Benzaldehyde	ug/L	--		NA	NA	<5.7	NA	NA	NA	NA	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	<0.025	NA	NA	NA	NA	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	<0.025	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	<0.025	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	<0.62	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	ug/L	--		NA	NA	<0.37	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	<3.1	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	<2.8	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	NA	<6	NA	NA	NA	NA	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	<2.5	NA	NA	NA	NA	NA
Caprolactam	ug/L	--		NA	NA	<2.4	NA	NA	NA	NA	NA
Carbazole	ug/L	--		NA	NA	<2.8	NA	NA	NA	NA	NA
Chrysene	ug/L	--		NA	NA	<0.33	NA	NA	NA	NA	NA
Cyclohexane	ug/L	--		NA	<0.28	0.19 J	<0.26	NA	NA	NA	0.86 J
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	<0.45	NA	NA	NA	NA	NA
Dibenzofuran	ug/L	--		NA	NA	<2.9	NA	NA	NA	NA	NA
Diethylphthalate	ug/L	110	(c)	NA	NA	<3	NA	NA	NA	NA	NA
Dimethylphthalate	ug/L	--		NA	NA	<3.1	NA	NA	NA	NA	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	NA	<2.5	NA	NA	NA	NA	NA
Di-n-Octylphthalate	ug/L	--		NA	NA	<2.5	NA	NA	NA	NA	NA
Diphenyl ether	ug/L	--		NA	NA	<2.2	NA	NA	NA	NA	NA
Fluoranthene	ug/L	1.9	(c)	NA	NA	<0.32	NA	NA	NA	NA	NA
Fluorene	ug/L	19	(c)	NA	NA	<0.32	NA	NA	NA	NA	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	<0.014	NA	NA	NA	NA	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	<0.2	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	<1.8	NA	NA	NA	NA	NA
Hexachloroethane	ug/L	8	(c)	NA	NA	<1.9	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	<0.41	NA	NA	NA	NA	NA
Isophorone	ug/L	920	(c)	NA	NA	<3.1	NA	NA	NA	NA	NA
Naphthalene	ug/L	13	(c)	NA	NA	<0.37	NA	1	1.81	1.92	NA
Nitrobenzene	ug/L	220	(c)	NA	NA	<2.7	NA	NA	NA	NA	NA
N-Nitrosodimethylamine	ug/L	--		NA	NA	<0.2	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	<3.4	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	ug/L	--		NA	NA	<3.6	NA	0.5	0.72	0.73	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-20A / -- / 41887.00 / OB-20A(090514)	OB-20A / -- / 42115.00 / OB-20A-042115	OB-20A / -- / 42221.00 / OB-20A-080515	OB-20A / -- / 42352.00 / OB-20A-121415	OB-20B / -- / 41887.00 / OB-20B(090514)	OB-20B / -- / 41921.00 / DUP(100914)	OB-20B / -- / 41921.00 / OB-20B(100914)	OB-20B / -- / 42115.00 / OB-20B-042115
Pentachlorophenol	ug/L	--		NA	NA	R	NA	NA	NA	NA	NA
Phenanthrene	ug/L	3.6	(c)	NA	NA	<0.42	NA	NA	NA	NA	NA
Phenol	ug/L	180	(c)	NA	NA	<1.5	NA	NA	NA	NA	NA
Pyrene	ug/L	0.3	(c)	NA	NA	<0.35	NA	NA	NA	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	238	NA	84.0	NA	120	85.4	93.3	NA
Antimony	ug/L	80	(c)	NA	NA	<0.500	NA	NA	NA	NA	NA
Arsenic	ug/L	150	(d) (e)	7.70	NA	7.10	NA	2.70	3.40	3.90	NA
Barium	ug/L	220	(c)	100	NA	140	NA	67.5	79.8	78.7	NA
Beryllium	ug/L	3.6	(c)	NA	NA	<0.500	NA	NA	NA	NA	NA
Cadmium	ug/L	0.17	(a)	NA	NA	<0.400	NA	NA	NA	NA	NA
Calcium	ug/L	--	(j)	23,300	29,900	28,200	NA	48,200	52,500	52,200	61,700
Chromium	ug/L	42	(c)	1.60	NA	1.10 J	NA	1.10	NA	NA	NA
Cobalt	ug/L	24	(c)	NA	NA	0.990 J	NA	24.0	26.8	26.0	NA
Copper	ug/L	5.56	(a)	NA	NA	<0.500	NA	NA	NA	NA	NA
Iron	ug/L	--	(j)	29,500	26,800	31,700	NA	35,500	40,700	41,500	46,700
Lead	ug/L	5.4	(d) (e)	NA	NA	0.440 J	NA	NA	NA	NA	NA
Magnesium	ug/L	--	(j)	2,430	<5,000	2,900	NA	8,850	10,500	10,700	11,500
Manganese	ug/L	120	(i)	828	NA	760	566	8,210	8,580	8,530	NA
Mercury	ug/L	0.77	(d) (e)	NA	NA	<0.150	NA	NA	NA	NA	NA
Nickel	ug/L	31.24	(a)	NA	NA	1.10 J	NA	3.60	5.30	5.20	NA
Potassium	ug/L	--	(j)	1,880	NA	2,100	NA	2,620	3,020	2,970	NA
Selenium	ug/L	5	(d)	NA	NA	<0.600	NA	NA	NA	NA	NA
Silver	ug/L	0.12	(c)	2.10	NA	<0.500	NA	2.60	NA	NA	NA
Sodium	ug/L	--	(j)	2,700	<10,000	3,300	NA	4,300	4,840	4,760	<10,000
Thallium	ug/L	10	(c)	NA	NA	<0.200	NA	NA	NA	NA	NA
Vanadium	ug/L	12	(c)	1.70	NA	2.60 B	NA	3.60	7.30	7.00	NA
Zinc	ug/L	71.69	(a)	22.8	NA	17.0 J	NA	10.1	NA	NA	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	26.0	NA	<9.60	NA	44.3	51.9	56.6	NA
Antimony	ug/L	80	(c)	NA	NA	<0.500	NA	NA	NA	NA	NA
Arsenic	ug/L	150	(d) (e)	3.90	NA	2.00 B	NA	2.90	3.70	3.10	NA
Barium	ug/L	220	(c)	88.9	NA	120	NA	52.9	64.1	62.6	NA
Beryllium	ug/L	3.6	(c)	NA	NA	<0.500	NA	NA	NA	NA	NA
Cadmium	ug/L	0.17	(a)	NA	NA	<0.400	NA	NA	NA	NA	NA
Calcium	ug/L	--	(j)	24,100	29,600	28,100	NA	44,900	55,400	53,900	60,000
Chromium	ug/L	42	(c)	NA	NA	<0.500	NA	NA	NA	NA	NA
Cobalt	ug/L	24	(c)	NA	NA	0.880 J	NA	23.6	27.7	27.3	NA
Copper	ug/L	5.56	(a)	NA	NA	<0.500	NA	NA	NA	NA	NA
Iron	ug/L	--	(j)	19,900	26,400	19,800	NA	27,200	32,000	31,100	44,800
Lead	ug/L	5.4	(d) (e)	NA	NA	<0.200	NA	NA	NA	NA	NA
Magnesium	ug/L	--	(j)	2,410	<5,000	2,900	NA	8,200	10,900	10,700	11,100
Manganese	ug/L	120	(i)	852	NA	790	NA	7,820	8,780	8,890	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-20A	OB-20A	OB-20A	OB-20A	OB-20B	OB-20B	OB-20B	OB-20B
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41887.00	42115.00	42221.00	42352.00	41887.00	41921.00	41921.00	42115.00
Sample Name:	Units	Chronic	Note	OB-20A(090514)	OB-20A-042115	OB-20A-080515	OB-20A-121415	OB-20B(090514)	DUP(100914)	OB-20B(100914)	OB-20B-042115
Mercury	ug/L	0.77	(d) (e)	NA	NA	<0.150	NA	NA	NA	NA	NA
Nickel	ug/L	31.24	(a)	NA	NA	1.80 J	NA	3.00	5.00	5.20	NA
Potassium	ug/L	--	(j)	1,990	NA	2,000	NA	2,450	3,080	3,040	NA
Selenium	ug/L	5	(d)	NA	NA	<0.600	NA	NA	NA	NA	NA
Silver	ug/L	0.12	(c)	1.80	NA	<0.500	NA	2.80	NA	NA	NA
Sodium	ug/L	--	(j)	2,860	<10,000	3,100	NA	4,050	4,930	4,850	<10,000
Thallium	ug/L	10	(c)	NA	NA	<0.200	NA	NA	NA	NA	NA
Vanadium	ug/L	12	(c)	NA	NA	<1.10 B	NA	2.90	6.90	6.30	NA
Zinc	ug/L	71.69	(a)	NA	NA	<10.0	NA	NA	NA	NA	NA
Miscellaneous											
Alkalinity	ug/L	--		99,900	NA	122,000	142,000	210,000	214,000	220,000	NA
Alkalinity, Bicarbonate	ug/L	--		NA	118,000	122,000	NA	NA	NA	NA	230,000
Alkalinity, Carbonate	ug/L	--		NA	118,000	NA	NA	NA	NA	NA	230,000
Bromide	ug/L	--		NA	NA	NA	1,870	NA	NA	NA	NA
Chloride	ug/L	--		2,200	NA	1,750	<30	NA	2,700	2,300	NA
Cyanide	ug/L	--		NA	NA	<7	NA	NA	NA	NA	NA
Fluoride, Total	ug/L	--		NA	NA	NA	100	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	3,400	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	<100	NA	<21	NA	NA	NA	<100
Nitrate-N	ug/L	--		NA	NA	NA	<21	NA	NA	NA	NA
Nitrite	ug/L	--		NA	<10	NA	<29	NA	NA	NA	<10
Sulfate	ug/L	--		NA	NA	<600	1,130	NA	NA	NA	NA
Sulfide	ug/L	--		NA	NA	NA	<820	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	144,000	NA	NA	NA	NA	NA	333,000
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	590	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	2,300	NA	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-20B	OB-20B	OB-20B	OB-21	OB-21	OB-21	OB-21	OB-21
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42221.00	42352.00	42352.00	41886.00	41886.00	42114.00	42222.00	42222.00
Sample Name:	Units	Chronic	Note	OB-20B-080515	DUP-1-121415	OB-20B-121415	DUP(090414)	OB-21(090414)	OB-21-042015	DUP-01-080615	OB-21-080615
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	NA	NA	NA	NA	<0.55	<0.55
Aroclor-1221	ug/L	--		<0.34	NA	NA	NA	NA	NA	<0.44	<0.44
Aroclor-1232	ug/L	--		<0.4	NA	NA	NA	NA	NA	<0.52	<0.52
Aroclor-1242	ug/L	--		<0.22	NA	NA	NA	NA	NA	<0.28	<0.28
Aroclor-1248	ug/L	--		<0.15	NA	NA	NA	NA	NA	<0.19	<0.19
Aroclor-1254	ug/L	--		<0.17	NA	NA	NA	NA	NA	<0.22	<0.22
Aroclor-1260	ug/L	--		<0.18	NA	NA	NA	NA	NA	<0.23	<0.23
Total PCBs	ug/L	--		<0.5	NA	NA	NA	NA	NA	<0.64	<0.64
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	<0.28	<0.28	NA	NA	<0.25	<0.19	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	<0.19	<0.19	NA	NA	<0.21	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	<0.34	<0.34	NA	NA	<0.52	<0.15	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	<0.08	<0.08	NA	NA	<0.21	<0.19	<0.19
1,1-Dichloroethane	ug/L	--		0.26 J	0.36 J	0.36 J	NA	NA	<0.17	<0.24	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.25	<0.34	<0.34	NA	NA	<0.51	<0.25	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	NA	NA	NA	NA	NA	<2.1	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	<0.007	<0.007	NA	NA	<0.99	<0.01	<0.01
1,2-Dibromoethane	ug/L	--		<0.01	<0.006	<0.006	NA	NA	<0.23	<0.01	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.22	<0.22	NA	NA	<0.19	<0.19	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.2	<0.25	<0.25	NA	NA	<0.18	<0.2	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.25	<0.18	<0.18	NA	NA	<0.39	<0.25	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	<0.33	<0.33	NA	NA	<0.23	<0.18	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	<0.33	<0.33	NA	NA	<0.27	<0.17	<0.17
2-Butanone	ug/L	--		<2.6	<2.2	<2.2	NA	NA	<5.6	<2.6	<2.6
2-Hexanone	ug/L	--		<1.3	<0.72	<0.72	NA	NA	<1.7	<1.3	<1.3
4-Methyl-2-pentanone	ug/L	--		<0.81	<0.63	<0.63	NA	NA	<1	<0.81	<0.81
Acetone	ug/L	--		<2.7	<1.1	<1.1	NA	NA	<3.3	<2.7	<2.7
Bromochloromethane	ug/L	--		NA	<0.3	<0.3	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.17	<0.15	<0.15	NA	NA	<0.23	<0.17	<0.17
Bromoform	ug/L	230	(c)	<0.29	<0.18	<0.18	NA	NA	<0.23	<0.29	<0.29
Bromomethane	ug/L	16	(c)	<0.35	<0.18	<0.18	NA	NA	<0.42	<0.35	<0.35
Carbon Disulfide	ug/L	--		<0.22	<0.22	<0.22	NA	NA	<0.25	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.18	<0.33	<0.33	NA	NA	<0.22	<0.18	<0.18
Chlorobenzene	ug/L	47	(c)	<0.18	<0.24	<0.24	NA	NA	<0.19	<0.18	<0.18
Chloroethane	ug/L	--		1.8	6.7	4.4	NA	NA	<0.34	<0.36	<0.36
Chloroform	ug/L	140	(c)	<0.23	<0.22	<0.22	NA	NA	<0.19	<0.23	<0.23
Chloromethane	ug/L	--		<0.36	<0.22	<0.22	NA	NA	<0.41	<0.36	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	<0.26	<0.26	NA	NA	<0.27	<0.21	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.17	<0.16	<0.16	NA	NA	<0.21	<0.17	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	<0.22	<0.22	NA	NA	<0.15	<0.25	<0.25

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-20B / -- / 42221.00 / OB-20B-080515	OB-20B / -- / 42352.00 / DUP-1-121415	OB-20B / -- / 42352.00 / OB-20B-121415	OB-21 / -- / 41886.00 / DUP(090414)	OB-21 / -- / 41886.00 / OB-21(090414)	OB-21 / -- / 42114.00 / OB-21-042015	OB-21 / -- / 42222.00 / DUP-01-080615	OB-21 / -- / 42222.00 / OB-21-080615
Dichlorodifluoromethane	ug/L	--		<0.17	<0.14	<0.14	NA	NA	<0.9	<0.17	<0.17
Isopropylbenzene	ug/L	--		<0.33	<0.32	<0.32	NA	NA	<0.23	<0.33	<0.33
Methyl acetate	ug/L	--		<0.58	<0.58	<0.58	NA	NA	<1.9	<0.58	<0.58
Methylcyclohexane	ug/L	--		0.54 J	0.68 J	0.66 J	NA	NA	<0.22	<0.09	<0.09
Methylene Chloride	ug/L	940	(c)	<0.22	<0.21	<0.21	NA	NA	<0.73	<0.22	0.31 J
Styrene	ug/L	32	(c)	<0.28	<0.17	<0.17	NA	NA	<0.27	<0.28	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.14	<0.12	<0.12	NA	NA	<0.4	<0.14	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	<0.18	<0.18	NA	NA	<0.65	<0.23	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.17	<0.19	<0.19	NA	NA	<0.19	<0.17	<0.17
Trichloroethene	ug/L	47	(c)	<0.2	<0.22	<0.22	NA	NA	<0.22	<0.2	<0.2
Trichlorofluoromethane	ug/L	--		<0.21	<0.15	<0.15	NA	NA	<0.43	<0.21	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.18	<0.06	<0.06	NA	NA	<0.15	<0.18	<0.18
Benzene	ug/L	114	(c)	0.27 J	0.51 J	0.5 J	NA	NA	<0.24	<0.2	<0.2
Toluene	ug/L	253	(c)	<0.17	<0.25	<0.25	NA	NA	<0.16	<0.17	<0.17
Ethylbenzene	ug/L	14	(c)	<0.19	<0.3	<0.3	NA	NA	<0.27	<0.19	<0.19
Xylenes (total)	ug/L	27	(c)	<0.58	<0.28	<0.28	NA	NA	<0.17	<0.58	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	<0.13	<0.13	NA	NA	<0.24	<0.17	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	<0.35	<0.35	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	NA	NA	NA	NA	<0.01	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	<0.27	<0.27	NA	NA	<0.21	<0.2	<0.2
1,4-Dioxane	ug/L	22000	(k)	0.95 J	1.37	1.25	NA	NA	NA	<0.27	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	NA	NA	NA	NA	NA	<2.8	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	NA	NA	NA	NA	NA	<6.9	<6.9
2,4,5-Trichlorophenol	ug/L	--		<7.1	NA	NA	NA	NA	NA	<7.1	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	NA	NA	NA	NA	NA	<6.8	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	NA	NA	NA	NA	NA	<5.6	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	NA	NA	NA	NA	NA	<4.2	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	<5.9	NA	NA	NA	NA	NA	<5.9	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	NA	NA	NA	NA	NA	<3.2	<3.2
2,6-Dinitrotoluene	ug/L	--		<2.3	NA	NA	NA	NA	NA	<2.3	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	NA	NA	NA	NA	NA	<2.8	<2.8
2-Chlorophenol	ug/L	24	(c)	<4.8	NA	NA	NA	NA	NA	<4.8	<4.8
2-Methylnaphthalene	ug/L	330	(c)	<0.4	NA	NA	NA	NA	NA	<0.4	<0.4
2-Methylphenol	ug/L	--		<2.3	NA	NA	NA	NA	NA	<2.3	<2.3
2-Nitroaniline	ug/L	--		<3.7	NA	NA	NA	NA	NA	<3.7	<3.7
2-Nitrophenol	ug/L	--		<5.3	NA	NA	NA	NA	NA	<5.3	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	NA	NA	NA	NA	NA	<3.3	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	NA	NA	NA	NA	NA	<2.2	<2.2
3-Nitroaniline	ug/L	--		<2.7	NA	NA	NA	NA	NA	<2.7	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	NA	NA	NA	NA	NA	<9.3	<9.3
4-Bromophenyl-phenylether	ug/L	--		<2.7	NA	NA	NA	NA	NA	<2.7	<2.7
4-Chloro-3-Methylphenol	ug/L	--		<4.5	NA	NA	NA	NA	NA	<4.5	<4.5

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-20B	OB-20B	OB-20B	OB-21	OB-21	OB-21	OB-21	OB-21
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				42221.00	42352.00	42352.00	41886.00	41886.00	42114.00	42222.00	42222.00
Sample Name:	Units	Chronic	Note	OB-20B-080515	DUP-1-121415	OB-20B-121415	DUP(090414)	OB-21(090414)	OB-21-042015	DUP-01-080615	OB-21-080615
4-Chloroaniline	ug/L	--		<4.2	NA	NA	NA	NA	NA	<4.2	<4.2
4-Chlorophenyl-phenylether	ug/L	--		<2.8	NA	NA	NA	NA	NA	<2.8	<2.8
4-Nitroaniline	ug/L	--		<3.1	NA	NA	NA	NA	NA	<3.1	<3.1
4-Nitrophenol	ug/L	60	(c)	<5.4	NA	NA	NA	NA	NA	<5.4	<5.4
Acenaphthene	ug/L	38	(c)	<0.32	NA	NA	NA	NA	NA	<0.32	<0.32
Acenaphthylene	ug/L	4840	(c)	<0.35	NA	NA	NA	NA	NA	<0.35	<0.35
Acetophenone	ug/L	--		<2.3	NA	NA	NA	NA	NA	<2.3	<2.3
Anthracene	ug/L	0.035	(c)	<0.38	NA	NA	NA	NA	NA	<0.38	<0.38
Atrazine	ug/L	--		<2.9	NA	NA	NA	NA	NA	<2.9	<2.9
Benzaldehyde	ug/L	--		<5.7	NA	NA	NA	NA	NA	<5.7	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	NA	NA	NA	NA	<0.025	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	NA	NA	NA	NA	<0.025	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	NA	NA	NA	NA	<0.025	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	NA	NA	NA	NA	NA	<0.62	<0.62
Benzo(k)fluoranthene	ug/L	--		<0.37	NA	NA	NA	NA	NA	<0.37	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	NA	NA	NA	NA	NA	<3.1	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	NA	NA	NA	NA	NA	<2.8	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	NA	NA	NA	NA	NA	<6	<6
Butylbenzylphthalate	ug/L	23	(c)	<2.5	NA	NA	NA	NA	NA	<2.5	<2.5
Caprolactam	ug/L	--		<2.4	NA	NA	NA	NA	NA	<2.4	<2.4
Carbazole	ug/L	--		<2.8	NA	NA	NA	NA	NA	<2.8	<2.8
Chrysene	ug/L	--		<0.33	NA	NA	NA	NA	NA	<0.33	<0.33
Cyclohexane	ug/L	--		0.87 J	0.99 J	1.2	NA	NA	<0.28	<0.13	<0.13
Dibenzo(a,h)anthracene	ug/L	--		<0.45	NA	NA	NA	NA	NA	<0.45	<0.45
Dibenzofuran	ug/L	--		<2.9	NA	NA	NA	NA	NA	<2.9	<2.9
Diethylphthalate	ug/L	110	(c)	<3	NA	NA	NA	NA	NA	<3	<3
Dimethylphthalate	ug/L	--		<3.1	NA	NA	NA	NA	NA	<3.1	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	NA	NA	NA	NA	NA	<2.5	<2.5
Di-n-Octylphthalate	ug/L	--		<2.5	NA	NA	NA	NA	NA	<2.5	<2.5
Diphenyl ether	ug/L	--		<2.2	NA	NA	NA	NA	NA	<2.2	<2.2
Fluoranthene	ug/L	1.9	(c)	<0.32	NA	NA	NA	NA	NA	<0.32	<0.32
Fluorene	ug/L	19	(c)	<0.32	NA	NA	NA	NA	NA	<0.32	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	NA	NA	NA	NA	<0.014	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	NA	NA	NA	NA	<0.2	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	NA	NA	NA	NA	NA	<1.8	<1.8
Hexachloroethane	ug/L	8	(c)	<1.9	NA	NA	NA	NA	NA	<1.9	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	NA	NA	NA	NA	NA	<0.41	<0.41
Isophorone	ug/L	920	(c)	<3.1	NA	NA	NA	NA	NA	<3.1	<3.1
Naphthalene	ug/L	13	(c)	1 J	NA	NA	NA	NA	NA	<0.37	<0.37
Nitrobenzene	ug/L	220	(c)	<2.7	NA	NA	NA	NA	NA	<2.7	<2.7
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	NA	NA	NA	NA	<0.2	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	NA	NA	NA	NA	NA	<3.4	<3.4
N-Nitrosodiphenylamine	ug/L	--		<3.6	NA	NA	NA	NA	NA	<3.6	<3.6

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-20B	OB-20B	OB-20B	OB-21	OB-21	OB-21	OB-21	OB-21
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				42221.00	42352.00	42352.00	41886.00	41886.00	42114.00	42222.00	42222.00
Sample Name:	Units	Chronic	Note	OB-20B-080515	DUP-1-121415	OB-20B-121415	DUP(090414)	OB-21(090414)	OB-21-042015	DUP-01-080615	OB-21-080615
Pentachlorophenol	ug/L	--		R	NA	NA	NA	NA	NA	<0.1	0.1 J
Phenanthrene	ug/L	3.6	(c)	<0.42	NA	NA	NA	NA	NA	<0.42	<0.42
Phenol	ug/L	180	(c)	<1.5	NA	NA	NA	NA	NA	<1.5	<1.5
Pyrene	ug/L	0.3	(c)	<0.35	NA	NA	NA	NA	NA	<0.35	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	66.0	NA	NA	2,350	1,350	NA	2,200	2,200
Antimony	ug/L	80	(c)	<0.500	NA	NA	NA	NA	NA	<0.500	<0.500
Arsenic	ug/L	150	(d) (e)	1.50 J	NA	NA	NA	2.90	NA	<1.30 B	<1.40 B
Barium	ug/L	220	(c)	84.0	NA	NA	15.3	10.7	NA	17.0	16.0
Beryllium	ug/L	3.6	(c)	<0.500	NA	NA	NA	NA	NA	<0.500	<0.500
Cadmium	ug/L	0.17	(a)	<0.400	NA	NA	NA	NA	NA	<0.400	<0.400
Calcium	ug/L	--	(j)	62,600	NA	NA	12,100	9,680	11,400	11,800	11,600
Chromium	ug/L	42	(c)	0.690 J	NA	NA	2.70	2.40	NA	3.20	3.00
Cobalt	ug/L	24	(c)	30.0	NA	NA	1.70	1.20	NA	2.00	2.10
Copper	ug/L	5.56	(a)	0.650 J	NA	NA	14.6	9.60	NA	15.0	16.0
Iron	ug/L	--	(j)	42,500	NA	NA	3,340	2,080	1,740	3,300	3,500
Lead	ug/L	5.4	(d) (e)	0.280 J	NA	NA	NA	NA	NA	1.70 J	1.80 J
Magnesium	ug/L	--	(j)	11,600	NA	NA	5,630	4,430	5,250	5,600	5,500
Manganese	ug/L	120	(i)	10,200	9,680	9,260	197	150	NA	150	150
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	NA	NA	NA	NA	<0.150	<0.150
Nickel	ug/L	31.24	(a)	5.80	NA	NA	4.60	2.00	NA	5.10	5.00
Potassium	ug/L	--	(j)	3,000	NA	NA	1,690	1,270	NA	1,500	1,500
Selenium	ug/L	5	(d)	<0.600	NA	NA	6.20	NA	NA	<0.600	<0.600
Silver	ug/L	0.12	(c)	<0.500	NA	NA	NA	1.50	NA	<0.500	<0.500
Sodium	ug/L	--	(j)	4,800	NA	NA	4,110	3,480	<10,000	15,500	3,900
Thallium	ug/L	10	(c)	<0.200	NA	NA	NA	NA	NA	<0.200	0.550 J
Vanadium	ug/L	12	(c)	3.90 B	NA	NA	4.10	2.50	NA	5.00 B	5.00 B
Zinc	ug/L	71.69	(a)	<10.0	NA	NA	12.5	11.0	NA	11.0 J	85.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	<9.60	NA	NA	NA	40.9	NA	1,100	640
Antimony	ug/L	80	(c)	0.500 J	NA	NA	NA	NA	NA	0.540 J	0.700 J
Arsenic	ug/L	150	(d) (e)	<1.10 B	NA	NA	NA	NA	NA	<0.980 B	<0.560 B
Barium	ug/L	220	(c)	63.0	NA	NA	3.00	2.80	NA	10.0	7.00
Beryllium	ug/L	3.6	(c)	<0.500	NA	NA	NA	NA	NA	<0.500	<0.500
Cadmium	ug/L	0.17	(a)	<0.400	NA	NA	NA	NA	NA	<0.400	<0.400
Calcium	ug/L	--	(j)	58,900	NA	NA	11,500	9,780	11,700	10,900	10,800
Chromium	ug/L	42	(c)	<0.500	NA	NA	NA	NA	NA	1.20 J	0.720 J
Cobalt	ug/L	24	(c)	28.0	NA	NA	NA	NA	NA	<0.500	<0.500
Copper	ug/L	5.56	(a)	<0.500	NA	NA	NA	NA	NA	2.90	1.60 J
Iron	ug/L	--	(j)	28,300	NA	NA	34.2	NA	<100	880	500
Lead	ug/L	5.4	(d) (e)	<0.200	NA	NA	NA	NA	NA	0.340 J	0.240 J
Magnesium	ug/L	--	(j)	11,200	NA	NA	4,890	4,160	5,170	5,000	4,800
Manganese	ug/L	120	(i)	10,600	NA	NA	NA	0.600	NA	22.0	9.90

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Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-20B	OB-20B	OB-20B	OB-21	OB-21	OB-21	OB-21	OB-21
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				42221.00	42352.00	42352.00	41886.00	41886.00	42114.00	42222.00	42222.00
Sample Name:	Units	Chronic	Note	OB-20B-080515	DUP-1-121415	OB-20B-121415	DUP(090414)	OB-21(090414)	OB-21-042015	DUP-01-080615	OB-21-080615
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	NA	NA	NA	NA	<0.150	<0.150
Nickel	ug/L	31.24	(a)	7.20	NA	NA	NA	NA	NA	1.20 J	1.10 J
Potassium	ug/L	--	(j)	2,800	NA	NA	999	877	NA	1,200	1,100
Selenium	ug/L	5	(d)	<0.600	NA	NA	5.40	NA	NA	<0.600	<0.600
Silver	ug/L	0.12	(c)	<0.500	NA	NA	NA	1.60	NA	<0.500	<0.500
Sodium	ug/L	--	(j)	4,800	NA	NA	3,910	3,550	<10,000	3,900	3,700
Thallium	ug/L	10	(c)	<0.200	NA	NA	NA	NA	NA	0.290 J	0.770 J
Vanadium	ug/L	12	(c)	<1.10 B	NA	NA	NA	NA	NA	3.30 B	2.50 B
Zinc	ug/L	71.69	(a)	<10.0	NA	NA	NA	NA	NA	<10.0	<10.0
Miscellaneous											
Alkalinity	ug/L	--		261,000	260,000	258,000	52,300	45,100	NA	43,100	46,000
Alkalinity, Bicarbonate	ug/L	--		261,000	NA	NA	NA	NA	36,700	43,100	46,000
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	36,800	NA	NA
Bromide	ug/L	--		NA	<81	<81	NA	NA	NA	NA	NA
Chloride	ug/L	--		1,620	<30	<30	NA	NA	NA	10,000	20,000
Cyanide	ug/L	--		<7	NA	NA	NA	NA	NA	<7	<7
Fluoride, Total	ug/L	--		NA	<15	130	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	24,000	29,000 J	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	<21	<21	NA	NA	100	NA	NA
Nitrate-N	ug/L	--		NA	<21	<21	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	<29	<29	NA	NA	<10	NA	NA
Sulfate	ug/L	--		<600	<110	630	NA	NA	NA	9,730	10,500
Sulfide	ug/L	--		NA	<820	<820	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	40,000	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	510	560	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	2,400	2,400	NA	NA	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-24	OB-24	OB-25	OB-25	OB-27	OB-27	OB-27	OB-27
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41885.00	42229.00	41891.00	42228.00	41892.00	42115.00	42222.00	42353.00
Sample Name:	Units	Chronic	Note	OB-24(090314)	OB-24-081315	OB-25(090914)	OB-25-081215	OB-27(091014)	OB-27-042115	OB-27-080615	OB-27-121515
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	<0.43	NA	NA	<0.56	NA
Aroclor-1221	ug/L	--		NA	<0.34	NA	<0.34	NA	NA	<0.44	NA
Aroclor-1232	ug/L	--		NA	<0.4	NA	<0.4	NA	NA	<0.52	NA
Aroclor-1242	ug/L	--		NA	<0.22	NA	<0.22	NA	NA	<0.29	NA
Aroclor-1248	ug/L	--		NA	<0.15	NA	<0.15	NA	NA	<0.2	NA
Aroclor-1254	ug/L	--		NA	<0.17	NA	<0.17	NA	NA	<0.22	NA
Aroclor-1260	ug/L	--		NA	<0.18	NA	<0.18	NA	NA	<0.23	NA
Total PCBs	ug/L	--		NA	<0.43	NA	<0.43	NA	NA	<0.65	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.19	NA	<0.19	NA	<0.25	<0.19	<0.28
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.19	NA	<0.19	NA	<0.21	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.15	NA	<0.15	NA	<0.52	<0.15	<0.34
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.19	NA	<0.19	NA	<0.21	<0.19	<0.08
1,1-Dichloroethane	ug/L	--		NA	<0.24	NA	<0.24	NA	<0.17	0.38 J	0.26 J
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.25	NA	<0.25	NA	<0.51	<0.25	<0.34
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<2.1	NA	<2.1	NA	NA	<2.1	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.99	<0.01	<0.007
1,2-Dibromoethane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.23	<0.01	<0.006
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.19	<0.19	<0.22
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.2	NA	<0.2	NA	<0.18	<0.2	0.26 J
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.25	NA	<0.25	NA	<0.39	<0.25	<0.18
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.18	NA	<0.18	NA	<0.23	<0.18	<0.33
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	<0.17	NA	<0.17	NA	<0.27	<0.17	<0.33
2-Butanone	ug/L	--		NA	<2.6	NA	<2.6	NA	<5.6	<2.6	<2.2
2-Hexanone	ug/L	--		NA	<1.3	NA	<1.3	NA	<1.7	<1.3	<0.72
4-Methyl-2-pentanone	ug/L	--		NA	<0.81	NA	<0.81	NA	<1	<0.81	<0.63
Acetone	ug/L	--		NA	<2.7	NA	<2.7	NA	<3.3	<2.7	<1.1
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<0.3
Bromodichloromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.23	<0.17	<0.15
Bromoform	ug/L	230	(c)	NA	<0.29	NA	<0.29	NA	<0.23	<0.29	<0.18 J
Bromomethane	ug/L	16	(c)	NA	<0.35 J	NA	<0.35	NA	<0.42	<0.35	<0.18
Carbon Disulfide	ug/L	--		NA	<0.22	NA	<0.22	NA	<0.25	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.18	NA	<0.18	NA	<0.22	<0.18	<0.33
Chlorobenzene	ug/L	47	(c)	NA	<0.18	NA	<0.18	NA	<0.19	<0.18	<0.24
Chloroethane	ug/L	--		NA	<0.36	NA	<0.36	89.4	87.2	83	48 J
Chloroform	ug/L	140	(c)	NA	<0.23	NA	<0.23	NA	<0.19	<0.23	<0.22
Chloromethane	ug/L	--		NA	<0.36	NA	<0.36	NA	<0.41	<0.36	<0.22
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.21	NA	<0.21	NA	<0.27	0.39 J	0.32 J
cis-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.21	<0.17	<0.16
Cyclohexane	ug/L	--		NA	NA	NA	NA	1.3	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	<0.25	NA	<0.25	NA	<0.15	<0.25	<0.22

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-24 / -- / 41885.00 / OB-24(090314)	OB-24 / -- / 42229.00 / OB-24-081315	OB-25 / -- / 41891.00 / OB-25(090914)	OB-25 / -- / 42228.00 / OB-25-081215	OB-27 / -- / 41892.00 / OB-27(091014)	OB-27 / -- / 42115.00 / OB-27-042115	OB-27 / -- / 42222.00 / OB-27-080615	OB-27 / -- / 42353.00 / OB-27-121515
Dichlorodifluoromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.9	<0.17	<0.14
Isopropylbenzene	ug/L	--		NA	<0.33	NA	<0.33	2.8	3.4	2.3	1.7
Methyl acetate	ug/L	--		NA	<0.58	NA	<0.58	NA	<1.9	<0.58	<0.58
Methylcyclohexane	ug/L	--		NA	<0.09	NA	<0.09	1	1.1 J	0.98 J	0.68 J
Methylene Chloride	ug/L	940	(c)	NA	<0.22	NA	<0.22	NA	<0.73	0.33 J	<0.21
Styrene	ug/L	32	(c)	NA	<0.28	NA	<0.28	NA	<0.27	<0.28	<0.17
Tetrachloroethene	ug/L	45	(c)	NA	<0.14	NA	<0.14	NA	<0.4	<0.14	<0.12
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.23	NA	<0.23	NA	<0.65	<0.23	<0.18
trans-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.19	<0.17	<0.19
Trichloroethene	ug/L	47	(c)	NA	<0.2	NA	<0.2	NA	<0.22	<0.2	<0.22
Trichlorofluoromethane	ug/L	--		NA	<0.21	NA	<0.21	NA	<0.43	<0.21	<0.15 J
Vinyl Chloride	ug/L	930	(c)	NA	<0.18	NA	<0.18	NA	<0.15	<0.18	<0.06
Benzene	ug/L	114	(c)	0.5	<0.2	NA	<0.2	2.6	3.1	3	1.9
Toluene	ug/L	253	(c)	NA	<0.17	18.4	<0.17	NA	<0.16	<0.17	<0.25
Ethylbenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.27	<0.19	<0.3
Xylenes (total)	ug/L	27	(c)	NA	<0.58	NA	<0.58	NA	<0.17	<0.58	<0.28
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.17	NA	<0.17	NA	<0.24	<0.17	<0.13
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<0.35 J
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.2	NA	<0.2	NA	<0.21	<0.2	<0.27
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	NA	<0.27	NA	NA	6.2 J	1.28
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.8	NA	<2.8	NA	NA	<2.8	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.9	NA	<6.9	NA	NA	<6.9	NA
2,4,5-Trichlorophenol	ug/L	--		NA	<7.1	NA	<7.1	NA	NA	<7.1	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.8	NA	<6.8	NA	NA	<6.8	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.6	NA	<5.6	NA	NA	<5.6	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	<4.2	NA	<4.2	NA	NA	<4.2	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.9	NA	<5.9	NA	NA	<5.9	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3.2	NA	<3.2	NA	NA	<3.2	NA
2,6-Dinitrotoluene	ug/L	--		NA	<2.3	NA	<2.3	NA	NA	<2.3	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.8	NA	<2.8	NA	NA	<2.8	NA
2-Chlorophenol	ug/L	24	(c)	NA	<4.8	NA	<4.8	NA	NA	<4.8	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.4	NA	<0.4	0.69	NA	<0.4	NA
2-Methylphenol	ug/L	--		NA	<2.3	NA	<2.3	NA	NA	<2.3	NA
2-Nitroaniline	ug/L	--		NA	<3.7	NA	<3.7	NA	NA	<3.7	NA
2-Nitrophenol	ug/L	--		NA	<5.3	NA	<5.3	NA	NA	<5.3	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.3	NA	<3.3	NA	NA	<3.3	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2.2	NA	<2.2	NA	NA	<2.2	NA
3-Nitroaniline	ug/L	--		NA	<2.7	NA	<2.7	NA	NA	<2.7	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<9.3	NA	<9.3	NA	NA	<9.3	NA
4-Bromophenyl-phenylether	ug/L	--		NA	<2.7	NA	<2.7	NA	NA	<2.7	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.5	NA	<4.5	NA	NA	<4.5	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-24 / -- / 41885.00 / OB-24(090314)	OB-24 / -- / 42229.00 / OB-24-081315	OB-25 / -- / 41891.00 / OB-25(090914)	OB-25 / -- / 42228.00 / OB-25-081215	OB-27 / -- / 41892.00 / OB-27(091014)	OB-27 / -- / 42115.00 / OB-27-042115	OB-27 / -- / 42222.00 / OB-27-080615	OB-27 / -- / 42353.00 / OB-27-121515
4-Chloroaniline	ug/L	--		NA	<4.2	NA	<4.2	NA	NA	<4.2	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.8	NA	<2.8	NA	NA	<2.8	NA
4-Nitroaniline	ug/L	--		NA	<3.1	NA	<3.1	NA	NA	<3.1	NA
4-Nitrophenol	ug/L	60	(c)	NA	<5.4	NA	<5.4	NA	NA	<5.4	NA
Acenaphthene	ug/L	38	(c)	NA	<0.32	NA	<0.32	0.491	NA	<0.32	NA
Acenaphthylene	ug/L	4840	(c)	NA	<0.35	NA	<0.35	NA	NA	<0.35	NA
Acetophenone	ug/L	--		NA	<2.3	NA	<2.3	NA	NA	<2.3	NA
Anthracene	ug/L	0.035	(c)	NA	<0.38	NA	<0.38	0.147	NA	<0.38	NA
Atrazine	ug/L	--		NA	<2.9	NA	<2.9	NA	NA	<2.9	NA
Benzaldehyde	ug/L	--		NA	<5.7	NA	<5.7	NA	NA	<5.7	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	<0.025	NA	NA	<0.0064	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	<0.025	NA	NA	<0.0064	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	<0.025	NA	NA	<0.0064	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.62	NA	<0.62	NA	NA	<0.62	NA
Benzo(k)fluoranthene	ug/L	--		NA	<0.37	NA	<0.37	NA	NA	<0.37	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	<3.1	NA	<3.1	NA	NA	<3.1	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.8	NA	<2.8	NA	NA	<2.8	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<6	NA	<6	NA	NA	<6	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.5	NA	<2.5	NA	NA	<2.5	NA
Caprolactam	ug/L	--		NA	<2.4	NA	<2.4	NA	NA	<2.4	NA
Carbazole	ug/L	--		NA	<2.8	NA	<2.8	NA	NA	<2.8	NA
Chrysene	ug/L	--		NA	<0.33	NA	<0.33	NA	NA	<0.33	NA
Cyclohexane	ug/L	--		NA	<0.13	NA	<0.13	NA	1.8 J	1.6 J	1.8 J
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.45	NA	<0.45	NA	NA	<0.45	NA
Dibenzofuran	ug/L	--		NA	<2.9	NA	<2.9	NA	NA	<2.9	NA
Diethylphthalate	ug/L	110	(c)	NA	<3	NA	<3	NA	NA	<3	NA
Dimethylphthalate	ug/L	--		NA	<3.1	NA	<3.1	NA	NA	<3.1	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	2.7	<2.5	NA	<2.5	NA	NA	<2.5	NA
Di-n-Octylphthalate	ug/L	--		NA	<2.5	NA	<2.5	NA	NA	<2.5	NA
Diphenyl ether	ug/L	--		NA	<2.2	NA	<2.2	NA	NA	<2.2	NA
Fluoranthene	ug/L	1.9	(c)	NA	<0.32	NA	<0.32	NA	NA	<0.32	NA
Fluorene	ug/L	19	(c)	NA	<0.32	NA	<0.32	0.494	NA	<0.32	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	<0.014	NA	NA	<0.0036	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.052	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.8	NA	<1.8	NA	NA	<1.8	NA
Hexachloroethane	ug/L	8	(c)	NA	<1.9	NA	<1.9	NA	NA	<1.9	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.41	NA	<0.41	NA	NA	<0.41	NA
Isophorone	ug/L	920	(c)	NA	<3.1	NA	<3.1	NA	NA	<3.1	NA
Naphthalene	ug/L	13	(c)	NA	<0.37	NA	<0.37	2.7	NA	2.5	NA
Nitrobenzene	ug/L	220	(c)	NA	<2.7	NA	<2.7	NA	NA	<2.7	NA
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.4	NA	<3.4	NA	NA	<3.4	NA
N-Nitrosodiphenylamine	ug/L	--		NA	<3.6	NA	<3.6	NA	NA	<3.6	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-24	OB-24	OB-25	OB-25	OB-27	OB-27	OB-27	OB-27
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41885.00	42229.00	41891.00	42228.00	41892.00	42115.00	42222.00	42353.00
Sample Name:	Units	Chronic	Note	OB-24(090314)	OB-24-081315	OB-25(090914)	OB-25-081215	OB-27(091014)	OB-27-042115	OB-27-080615	OB-27-121515
Pentachlorophenol	ug/L	--		NA	<0.1	NA	<0.1	NA	NA	<0.1	NA
Phenanthrene	ug/L	3.6	(c)	NA	<0.42	NA	<0.42	0.716	NA	<0.42	NA
Phenol	ug/L	180	(c)	NA	<1.5	NA	<1.5	NA	NA	<1.5	NA
Pyrene	ug/L	0.3	(c)	NA	<0.35	NA	<0.35	NA	NA	<0.35	NA
Inorganics											
Aluminum	ug/L	87	(i)	129	60.0	1,840	12,800	213	NA	64.0	NA
Antimony	ug/L	80	(c)	NA	<0.500	NA	<0.830 B	NA	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	NA	1.80 J	NA	4.10	23.0	NA	26.0	NA
Barium	ug/L	220	(c)	36.4	48.0	36.6	76.0	66.4	NA	70.0	NA
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	0.900	1.80	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	98,000	99,200	33,500	43,400	35,500	42,800	38,100	NA
Chromium	ug/L	42	(c)	NA	0.920 J	3.10	6.30	1.10	NA	<0.500	NA
Cobalt	ug/L	24	(c)	NA	<0.500	1.10	5.30	3.80	NA	4.10	NA
Copper	ug/L	5.56	(a)	NA	1.10 J	8.40	31.0	NA	NA	<0.500	NA
Iron	ug/L	--	(j)	220	170	2,580	8,100	51,900	65,200	52,000	NA
Lead	ug/L	5.4	(d) (e)	NA	0.240 J	3.80	11.0	1.40	NA	<0.200	NA
Magnesium	ug/L	--	(j)	24,500	23,800	7,410	9,800	4,940	5,810	5,000	NA
Manganese	ug/L	120	(i)	599	1,300	50.6	340	7,190	NA	8,000	7,120
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	NA	1.50 J	3.80	10.0	3.00	NA	2.40	NA
Potassium	ug/L	--	(j)	2,210	2,400	7,030	7,700	1,740	NA	1,600	NA
Selenium	ug/L	5	(d)	NA	<0.600	NA	1.70 J	7.70	NA	0.770 J	NA
Silver	ug/L	0.12	(c)	NA	<0.500	NA	<0.500	1.80	NA	<0.500	NA
Sodium	ug/L	--	(j)	15,800	16,200	45,000	69,900	3,120	<10,000	3,100	NA
Thallium	ug/L	10	(c)	NA	0.440 J	NA	0.210 J	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	3.50 B	3.40	11.0	4.20	NA	<1.60 B	NA
Zinc	ug/L	71.69	(a)	NA	<10.0	26.0	52.0	15.4	NA	<10.0	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	64.1	10.0 J	NA	1,800	NA	NA	<9.60	NA
Antimony	ug/L	80	(c)	NA	<0.500	NA	1.30 J	NA	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	NA	0.640 J	NA	1.00 J	4.50	NA	<0.920 B	NA
Barium	ug/L	220	(c)	32.8	32.0	29.2	36.0	50.5	NA	43.0	NA
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	0.900	0.640 J	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	98,600	99,200	36,800	39,500	36,700	42,000	36,300	NA
Chromium	ug/L	42	(c)	NA	<0.500	1.00	2.00	NA	NA	<0.500	NA
Cobalt	ug/L	24	(c)	NA	<0.500	NA	0.820 J	4.00	NA	3.70	NA
Copper	ug/L	5.56	(a)	NA	<0.500	5.90	8.20	NA	NA	<0.500	NA
Iron	ug/L	--	(j)	13.2	14.0 J	NA	1,600	30,900	61,200	5,100	NA
Lead	ug/L	5.4	(d) (e)	NA	<0.200	2.20	1.00 J	NA	NA	<0.200	NA
Magnesium	ug/L	--	(j)	24,500	24,600	7,750	7,800	5,110	5,770	5,000	NA
Manganese	ug/L	120	(i)	64.3	22.0	8.40	51.0	7,510	NA	8,200	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-24 / -- / 41885.00 / OB-24(090314)	OB-24 / -- / 42229.00 / OB-24-081315	OB-25 / -- / 41891.00 / OB-25(090914)	OB-25 / -- / 42228.00 / OB-25-081215	OB-27 / -- / 41892.00 / OB-27(091014)	OB-27 / -- / 42115.00 / OB-27-042115	OB-27 / -- / 42222.00 / OB-27-080615	OB-27 / -- / 42353.00 / OB-27-121515
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	NA	<0.500	1.30	2.40	2.20	NA	2.70 J	NA
Potassium	ug/L	--	(j)	2,180	2,100	7,660	7,300	1,680	NA	1,500	NA
Selenium	ug/L	5	(d)	NA	<0.600	NA	<0.600	6.10	NA	<0.600	NA
Silver	ug/L	0.12	(c)	NA	<0.500	NA	<0.500	1.50	NA	<0.500	NA
Sodium	ug/L	--	(j)	15,700	18,000	49,900	67,700	3,070	<10,000	3,000	NA
Thallium	ug/L	10	(c)	NA	0.310 J	NA	<0.200	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	2.20 B	NA	5.00 B	3.30	NA	<1.20 B	NA
Zinc	ug/L	71.69	(a)	NA	<10.0	16.4	13.0 J	10.6	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		297,000	218,000	135,000	124,000	150,000	NA	174,000	136,000
Alkalinity, Bicarbonate	ug/L	--		NA	218,000	NA	124,000	NA	152,000	174,000	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	152,000	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<81
Chloride	ug/L	--		92,500	86,800	71,100	91,700	NA	NA	2,980	1,440
Cyanide	ug/L	--		NA	<7	NA	<7	NA	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	83
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	15,000
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	<100	NA	<21
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<21
Nitrite	ug/L	--		NA	NA	NA	NA	NA	<10	NA	<29 J
Sulfate	ug/L	--		33,000	27,300	11,300	9,240	NA	NA	<600	600 J
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	<820
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	256,000	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	510
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	2,000

2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-28	OB-28	OB-29	OB-29	OB-30B	OB-30B	OB-30C	OB-30C
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41892.00	42229.00	41891.00	42228.00	41886.00	42222.00	41886.00	42222.00
Sample Name:	Units	Chronic	Note	OB-28(091014)	OB-28-081315	OB-29(090914)	OB-29-081215	OB-30B(090414)	OB-30B-080615	OB-30C(090414)	OB-30C-080615
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	<0.43	NA	<0.54	NA	<0.57
Aroclor-1221	ug/L	--		NA	<0.34	NA	<0.34	NA	<0.43	NA	<0.45
Aroclor-1232	ug/L	--		NA	<0.4	NA	<0.4	NA	<0.5	NA	<0.53
Aroclor-1242	ug/L	--		NA	<0.22	NA	<0.22	NA	<0.28	NA	<0.29
Aroclor-1248	ug/L	--		NA	<0.15	NA	<0.15	NA	<0.19	NA	<0.2
Aroclor-1254	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.21	NA	<0.22
Aroclor-1260	ug/L	--		NA	<0.18	NA	<0.18	NA	<0.23	NA	<0.24
Total PCBs	ug/L	--		NA	<0.43	NA	<0.43	NA	<0.63	NA	<0.66
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.15	NA	<0.15	NA	<0.15	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1-Dichloroethane	ug/L	--		NA	<0.24	NA	<0.24	NA	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<2.1	NA	<2.1	NA	<2.1	NA	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2-Dibromoethane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
2-Butanone	ug/L	--		NA	<2.6	NA	<2.6	NA	<2.6	NA	<2.6
2-Hexanone	ug/L	--		NA	<1.3	NA	<1.3	NA	<1.3	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		NA	<0.81	NA	<0.81	NA	<0.81	NA	<0.81
Acetone	ug/L	--		NA	<2.7	NA	<2.7	NA	<2.7	NA	<2.7
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Bromoform	ug/L	230	(c)	NA	<0.29	NA	<0.29	NA	<0.29	NA	<0.29
Bromomethane	ug/L	16	(c)	NA	<0.35 J	NA	<0.35	NA	<0.35	NA	<0.35
Carbon Disulfide	ug/L	--		NA	<0.22	NA	<0.22	NA	<0.22	NA	<0.22
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Chlorobenzene	ug/L	47	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Chloroethane	ug/L	--		NA	<0.36	NA	<0.36	NA	<0.36	NA	<0.36
Chloroform	ug/L	140	(c)	NA	<0.23	NA	<0.23	NA	<0.23	NA	<0.23
Chloromethane	ug/L	--		NA	<0.36	NA	<0.36	NA	<0.36	NA	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.21	NA	<0.21	NA	<0.21	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-28 - - 41892.00 OB-28(091014)	OB-28 - - 42229.00 OB-28-081315	OB-29 - - 41891.00 OB-29(090914)	OB-29 - - 42228.00 OB-29-081215	OB-30B - - 41886.00 OB-30B(090414)	OB-30B - - 42222.00 OB-30B-080615	OB-30C - - 41886.00 OB-30C(090414)	OB-30C - - 42222.00 OB-30C-080615
Dichlorodifluoromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Isopropylbenzene	ug/L	--		NA	<0.33	NA	<0.33	NA	<0.33	NA	<0.33
Methyl acetate	ug/L	--		NA	<0.58	NA	<0.58	NA	<0.58	NA	<0.58
Methylcyclohexane	ug/L	--		NA	<0.09	NA	<0.09	NA	<0.09	NA	<0.09
Methylene Chloride	ug/L	940	(c)	NA	<0.22	NA	<0.28 B	NA	<0.22	NA	<0.22
Styrene	ug/L	32	(c)	NA	<0.28	NA	<0.28	NA	<0.28	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	NA	<0.14	NA	<0.14	NA	<0.14	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.23	NA	<0.23	NA	<0.23	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Trichloroethene	ug/L	47	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
Trichlorofluoromethane	ug/L	--		NA	<0.21	NA	<0.21	NA	<0.21	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Benzene	ug/L	114	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
Toluene	ug/L	253	(c)	NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Ethylbenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
Xylenes (total)	ug/L	27	(c)	NA	<0.58	NA	<0.58	NA	<0.58	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.17	NA	<0.17	0.29	<0.17	NA	0.28 J
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	NA	<0.27	NA	<0.27	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.8	NA	<2.8	NA	<2.8	NA	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.9	NA	<6.9	NA	<6.9	NA	<6.9
2,4,5-Trichlorophenol	ug/L	--		NA	<7.1	NA	<7.1	NA	<7.1	NA	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.8	NA	<6.8	NA	<6.8	NA	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.6	NA	<5.6	NA	<5.6	NA	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	NA	<4.2	NA	<4.2	NA	<4.2	NA	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.9	NA	<5.9	NA	<5.9	NA	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3.2	NA	<3.2	NA	<3.2	NA	<3.2
2,6-Dinitrotoluene	ug/L	--		NA	<2.3	NA	<2.3	NA	<2.3	NA	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.8	NA	<2.8	NA	<2.8	NA	<2.8
2-Chlorophenol	ug/L	24	(c)	NA	<4.8	NA	<4.8	NA	<4.8	NA	<4.8
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.4	NA	<0.4	NA	<0.4	NA	<0.4
2-Methylphenol	ug/L	--		NA	<2.3	NA	<2.3	NA	<2.3	NA	<2.3
2-Nitroaniline	ug/L	--		NA	<3.7	NA	<3.7	NA	<3.7	NA	<3.7
2-Nitrophenol	ug/L	--		NA	<5.3	NA	<5.3	NA	<5.3	NA	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.3	NA	<3.3	NA	<3.3	NA	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2.2	NA	<2.2	NA	<2.2	NA	<2.2
3-Nitroaniline	ug/L	--		NA	<2.7	NA	<2.7	NA	<2.7	NA	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<9.3	NA	<9.3	NA	<9.3	NA	<9.3
4-Bromophenyl-phenylether	ug/L	--		NA	<2.7	NA	<2.7	NA	<2.7	NA	<2.7
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.5	NA	<4.5	NA	<4.5	NA	<4.5

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-28	OB-28	OB-29	OB-29	OB-30B	OB-30B	OB-30C	OB-30C
Sample Depth():				- -	- -	- -	- -	- -	- -	- -	- -
Date Collected:				41892.00	42229.00	41891.00	42228.00	41886.00	42222.00	41886.00	42222.00
Sample Name:	Units	Chronic	Note	OB-28(091014)	OB-28-081315	OB-29(090914)	OB-29-081215	OB-30B(090414)	OB-30B-080615	OB-30C(090414)	OB-30C-080615
4-Chloroaniline	ug/L	--		NA	<4.2	NA	<4.2	NA	<4.2	NA	<4.2
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.8	NA	<2.8	NA	<2.8	NA	<2.8
4-Nitroaniline	ug/L	--		NA	<3.1	NA	<3.1	NA	<3.1	NA	<3.1
4-Nitrophenol	ug/L	60	(c)	NA	<5.4	NA	<5.4	NA	<5.4	NA	<5.4
Acenaphthene	ug/L	38	(c)	NA	<0.32	NA	<0.32	NA	<0.32	NA	<0.32
Acenaphthylene	ug/L	4840	(c)	NA	<0.35	NA	<0.35	NA	<0.35	NA	<0.35
Acetophenone	ug/L	--		NA	<2.3	NA	<2.3	NA	<2.3	NA	<2.3
Anthracene	ug/L	0.035	(c)	NA	<0.38	NA	<0.38	NA	<0.38	NA	<0.38
Atrazine	ug/L	--		NA	<2.9	NA	<2.9	NA	<2.9	NA	<2.9
Benzaldehyde	ug/L	--		NA	<5.7	NA	<5.7	NA	<5.7	NA	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	<0.025	NA	<0.025	NA	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	<0.025	NA	<0.025	NA	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	<0.025	NA	<0.025	NA	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.62	NA	<0.62	NA	<0.62	NA	<0.62
Benzo(k)fluoranthene	ug/L	--		NA	<0.37	NA	<0.37	NA	<0.37	NA	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		NA	<3.1	NA	<3.1	NA	<3.1	NA	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.8	NA	<2.8	NA	<2.8	NA	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<6	NA	<6	NA	<6	NA	<6
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.5	NA	<2.5	NA	<2.5	NA	<2.5
Caprolactam	ug/L	--		NA	<2.4	NA	<2.4	NA	<2.4	NA	<2.4
Carbazole	ug/L	--		NA	<2.8	NA	<2.8	NA	<2.8	NA	<2.8
Chrysene	ug/L	--		NA	<0.33	NA	<0.33	NA	<0.33	NA	<0.33
Cyclohexane	ug/L	--		NA	<0.13	NA	<0.13	NA	<0.13	NA	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.45	NA	<0.45	NA	<0.45	NA	<0.45
Dibenzofuran	ug/L	--		NA	<2.9	NA	<2.9	NA	<2.9	NA	<2.9
Diethylphthalate	ug/L	110	(c)	NA	<3	NA	<3	NA	<3	NA	<3
Dimethylphthalate	ug/L	--		NA	<3.1	NA	<3.1	NA	<3.1	NA	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.5	NA	<2.5	1.6	<2.5	1.2	<2.5
Di-n-Octylphthalate	ug/L	--		NA	<2.5	5.7	<2.5	NA	<2.5	NA	<2.5
Diphenyl ether	ug/L	--		NA	<2.2	NA	<2.2	NA	<2.2	NA	<2.2
Fluoranthene	ug/L	1.9	(c)	NA	<0.32	NA	<0.32	NA	<0.32	NA	<0.32
Fluorene	ug/L	19	(c)	NA	<0.32	NA	<0.32	NA	<0.32	NA	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	<0.014	NA	<0.014	NA	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.8	NA	<1.8	NA	<1.8	NA	<1.8
Hexachloroethane	ug/L	8	(c)	NA	<1.9	NA	<1.9	NA	<1.9	NA	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.41	NA	<0.41	NA	<0.41	NA	<0.41
Isophorone	ug/L	920	(c)	NA	<3.1	NA	<3.1	NA	<3.1	NA	<3.1
Naphthalene	ug/L	13	(c)	NA	<0.37	NA	<0.37	NA	<0.37	NA	<0.37
Nitrobenzene	ug/L	220	(c)	NA	<2.7	NA	<2.7	NA	<2.7	NA	<2.7
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.4	NA	<3.4	NA	<3.4	NA	<3.4
N-Nitrosodiphenylamine	ug/L	--		NA	<3.6	NA	<3.6	NA	<3.6	NA	<3.6

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-28 / -- / 41892.00 / OB-28(091014)	OB-28 / -- / 42229.00 / OB-28-081315	OB-29 / -- / 41891.00 / OB-29(090914)	OB-29 / -- / 42228.00 / OB-29-081215	OB-30B / -- / 41886.00 / OB-30B(090414)	OB-30B / -- / 42222.00 / OB-30B-080615	OB-30C / -- / 41886.00 / OB-30C(090414)	OB-30C / -- / 42222.00 / OB-30C-080615
Pentachlorophenol	ug/L	--		NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	<0.42	NA	<0.42	NA	<0.42	NA	<0.42
Phenol	ug/L	180	(c)	NA	<1.5	NA	<1.5	NA	<1.5	NA	<1.5
Pyrene	ug/L	0.3	(c)	NA	<0.35	NA	<0.35	NA	<0.35	NA	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	404	1,400	1,270	1,700	429	82.0	890	1,800
Antimony	ug/L	80	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	1.50 J	NA	<1.50 B	NA	<0.890 B	NA	2.30 B
Barium	ug/L	220	(c)	72.3	84.0	14.6	13.0	20.7	29.0	13.8	25.0
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	<0.400	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	134,000	141,000	12,800	13,900	21,800	24,500	27,300	38,200
Chromium	ug/L	42	(c)	1.30	2.40	3.00	1.80 J	NA	<0.500	NA	2.90
Cobalt	ug/L	24	(c)	1.70	2.80	NA	0.750 J	1.60	2.20	NA	1.40 J
Copper	ug/L	5.56	(a)	2.70	6.00	17.1	3.10	NA	1.20 J	2.20	3.70
Iron	ug/L	--	(j)	802	2,700	1,730	1,200	479	130	1,200	3,000
Lead	ug/L	5.4	(d) (e)	1.70	1.00 J	NA	0.540 J	NA	<0.200	NA	1.30 J
Magnesium	ug/L	--	(j)	30,400	31,600	4,060	4,100	5,050	5,500	14,900	16,700
Manganese	ug/L	120	(i)	3,920	4,400	40.7	36.0	1,250	1,600	74.8	160
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	3.00	2.70	4.10	2.20	1.50	2.30	1.20	3.80
Potassium	ug/L	--	(j)	4,480	4,600	1,440	1,300	2,150	2,500	10,300	5,200
Selenium	ug/L	5	(d)	NA	<0.600	NA	<0.600	3.60	<0.600	4.30	2.40
Silver	ug/L	0.12	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Sodium	ug/L	--	(j)	26,000	24,400	3,070	3,200	21,300	23,800	11,300	8,700
Thallium	ug/L	10	(c)	NA	<0.200	NA	<0.200	NA	<0.200	NA	<0.200
Vanadium	ug/L	12	(c)	2.90	5.50 B	2.30	2.80 B	1.60	<1.50 B	5.00	8.40
Zinc	ug/L	71.69	(a)	9.00	<10.0	13.5	<10.0	NA	<10.0	NA	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.60	30.3	840	44.6	11.0 J	47.6	110
Antimony	ug/L	80	(c)	NA	<0.500	NA	0.730 J	NA	0.610 J	NA	0.500 J
Arsenic	ug/L	150	(d) (e)	NA	0.820 J	NA	12.0	NA	0.580 J	NA	1.20 J
Barium	ug/L	220	(c)	66.1	73.0	6.50	15.0	18.5	28.0	9.80	15.0
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	<0.400	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	130,000	103,000	13,500	47,400	22,100	24,900	28,900	37,300
Chromium	ug/L	42	(c)	0.900	<0.500	0.900	<0.500	NA	<0.500	NA	<0.500
Cobalt	ug/L	24	(c)	1.40	1.50 J	NA	<0.500	1.40	2.20	NA	<0.500
Copper	ug/L	5.56	(a)	3.10	1.60 J	NA	<0.500	NA	<1.50 B	NA	<0.500
Iron	ug/L	--	(j)	98.9	<10.0	NA	18.0 J	28.1	19.0 J	17.5	99.0
Lead	ug/L	5.4	(d) (e)	1.50	<0.200	1.60	<0.200	NA	0.330 J	NA	<0.200
Magnesium	ug/L	--	(j)	29,700	29,500	3,940	<130	5,030	5,700	17,000	16,500
Manganese	ug/L	120	(i)	3,790	540	NA	<0.500	1,270	1,600	34.8	66.0

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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	OB-28 / -- / 41892.00 / OB-28(091014)	OB-28 / -- / 42229.00 / OB-28-081315	OB-29 / -- / 41891.00 / OB-29(090914)	OB-29 / -- / 42228.00 / OB-29-081215	OB-30B / -- / 41886.00 / OB-30B(090414)	OB-30B / -- / 42222.00 / OB-30B-080615	OB-30C / -- / 41886.00 / OB-30C(090414)	OB-30C / -- / 42222.00 / OB-30C-080615
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	2.30	1.60 J	NA	0.970 J	1.00	3.10	NA	1.40 J
Potassium	ug/L	--	(j)	4,060	4,000	1,240	10,800	2,090	2,500	12,200	5,000
Selenium	ug/L	5	(d)	NA	<0.600	NA	3.80	NA	<0.600	5.30	2.00
Silver	ug/L	0.12	(c)	NA	<0.500	1.20	<0.500	NA	<0.500	NA	<0.500
Sodium	ug/L	--	(j)	24,600	24,200	3,130	131,000	21,900	24,000	13,400	8,600
Thallium	ug/L	10	(c)	NA	<0.200	NA	<0.200	NA	<0.200	NA	<0.200
Vanadium	ug/L	12	(c)	2.30	<1.70 B	NA	15.0 B	NA	<1.70 B	4.10	5.90
Zinc	ug/L	71.69	(a)	8.90	<10.0	NA	<10.0	NA	<10.0	NA	<10.0
Miscellaneous											
Alkalinity	ug/L	--		447,000	362,000	48,700	44,600	90,200	67,300	115,000	111,000
Alkalinity, Bicarbonate	ug/L	--		NA	362,000	NA	44,600	NA	67,300	NA	111,000
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		88,300	89,400	2,900	3,220	24,700	33,500	35,400	34,000
Cyanide	ug/L	--		NA	<7	NA	<7	NA	<7	NA	<7
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		19,900	18,100	NA	5,380	15,600	18,600	24,700	24,500
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-31	OB-32	PM AIR SHAFT	PM AIR SHAFT	PM AIR SHAFT	RW-2	RW-2	RW-2
Sample Depth():				- -	- -	50	180	230	279 - 289	279 - 289	452 - 462
Date Collected:				42397.00	42397.00	41898.00	41898.00	41899.00	41908.00	42237.00	41908.00
Sample Name:	Units	Chronic	Note	OB-31-012816	OB-32-012816	PMAIRSHAFT-50(091614)	PMAIRSHAFT-180(091614)	PMAIRSHAFT-230(091714)	RW-2(279-289)(092614)	RW-2-(279-289)-082115	RW-2(452-462)(092614)
PCBs											
Aroclor-1016	ug/L	--		NA	NA	NA	NA	NA	NA	<0.43	NA
Aroclor-1221	ug/L	--		NA	NA	NA	NA	NA	NA	<0.34	NA
Aroclor-1232	ug/L	--		NA	NA	NA	NA	NA	NA	<0.4	NA
Aroclor-1242	ug/L	--		NA	NA	NA	NA	NA	NA	<0.22	NA
Aroclor-1248	ug/L	--		NA	NA	NA	NA	NA	NA	<0.15	NA
Aroclor-1254	ug/L	--		NA	NA	NA	NA	NA	NA	<0.17	NA
Aroclor-1260	ug/L	--		NA	NA	NA	NA	NA	NA	<0.18	NA
Total PCBs	ug/L	--		NA	NA	NA	NA	NA	NA	<0.43	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.28	<0.28	NA	NA	NA	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	<0.19	NA	NA	NA	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.34 J	<0.34 J	NA	NA	NA	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.08	<0.08	NA	NA	NA	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		<0.24	<0.24	NA	0.61	NA	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	<0.34	<0.34	NA	NA	NA	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	<2.1	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.007	<0.007	NA	NA	NA	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		<0.006	<0.006	NA	NA	NA	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.22	<0.22	NA	NA	0.53	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.25	<0.25	NA	NA	NA	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.18	<0.18	NA	NA	NA	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.33	<0.33	NA	NA	1.7	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.33	<0.33	NA	0.49	4.2	0.25	0.24 J	NA
2-Butanone	ug/L	--		<2.2	<2.2	NA	NA	NA	NA	3.2 J	NA
2-Hexanone	ug/L	--		<0.72	<0.72	NA	NA	NA	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		<0.63	<0.63	NA	NA	NA	NA	<0.81	NA
Acetone	ug/L	--		<1.1	<1.1	NA	NA	NA	9.7	12 J	21.9
Bromochloromethane	ug/L	--		<0.3	<0.3	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.15	<0.15	NA	NA	NA	NA	<0.17	NA
Bromoform	ug/L	230	(c)	<0.18	<0.18	NA	NA	NA	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	<0.18	<0.18	NA	NA	NA	NA	<0.35 J	NA
Carbon Disulfide	ug/L	--		<0.22	<0.22	NA	NA	NA	NA	<0.22	1.7
Carbon Tetrachloride	ug/L	240	(c)	<0.33	<0.33	NA	NA	NA	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	<0.24	<0.24	NA	1.3	18.9	2.3	2.3	NA
Chloroethane	ug/L	--		2.5	<0.37	NA	25.2	9.7	NA	<0.36	NA
Chloroform	ug/L	140	(c)	<0.22	<0.22	NA	NA	NA	NA	<0.23	NA
Chloromethane	ug/L	--		<0.22	<0.22	NA	NA	NA	0.39	<0.36 J	0.37
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.26	<0.26	NA	0.63	NA	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		<0.16	<0.16	NA	NA	NA	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	0.94	2	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.22	<0.22	NA	NA	NA	NA	<0.25	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-31	OB-32	PM AIR SHAFT	PM AIR SHAFT	PM AIR SHAFT	RW-2	RW-2	RW-2
Sample Depth():				- -	- -	50	180	230	279 - 289	279 - 289	452 - 462
Date Collected:				42397.00	42397.00	41898.00	41898.00	41899.00	41908.00	42237.00	41908.00
Sample Name:	Units	Chronic	Note	OB-31-012816	OB-32-012816	PMAIRSHAFT-50(091614)	PMAIRSHAFT-180(091614)	PMAIRSHAFT-230(091714)	RW-2(279-289)(092614)	RW-2-(279-289)-082115	RW-2(452-462)(092614)
Dichlorodifluoromethane	ug/L	--		<0.14	<0.14	NA	NA	NA	NA	<0.17	NA
Isopropylbenzene	ug/L	--		<0.32	<0.32	NA	2.1	8.9	NA	<0.33	NA
Methyl acetate	ug/L	--		<0.58 J	<0.58 J	NA	NA	NA	NA	<0.58 J	NA
Methylcyclohexane	ug/L	--		<0.22	<0.22	NA	0.24	0.38	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	<0.21	<0.21	NA	NA	NA	NA	<0.22	NA
Styrene	ug/L	32	(c)	<0.17	<0.17	NA	NA	NA	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	<0.12	<0.12	NA	NA	NA	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.18	<0.18	NA	NA	NA	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		<0.19	<0.19	NA	NA	NA	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	<0.22	<0.22	NA	NA	NA	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		<0.15	<0.15	NA	NA	NA	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	<0.06	<0.06	NA	NA	NA	NA	<0.18	NA
Benzene	ug/L	114	(c)	0.1 J	<0.09	NA	6.6	32.9	NA	0.22 J	NA
Toluene	ug/L	253	(c)	<0.25	<0.25	NA	0.27	0.39	0.76	0.83 J	0.65
Ethylbenzene	ug/L	14	(c)	<0.3	<0.3	NA	NA	NA	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	<0.28	<0.28	NA	1.4	0.83	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	<0.13	<0.13	NA	NA	NA	0.3	0.25 J	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		<0.35	<0.35	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	NA	NA	NA	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.27	<0.27	NA	NA	NA	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	0.414	<0.056	NA	NA	NA	NA	10	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	NA	NA	NA	NA	<2.7	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	NA	NA	NA	NA	<6.8	NA
2,4,5-Trichlorophenol	ug/L	--		NA	NA	NA	NA	NA	NA	<7	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	NA	NA	NA	NA	<6.7	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	NA	NA	NA	NA	<5.5	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	NA	NA	NA	NA	<4.1	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	NA	NA	NA	NA	<5.8	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	NA	NA	NA	NA	<3.1	NA
2,6-Dinitrotoluene	ug/L	--		NA	NA	NA	NA	NA	NA	<2.3	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	NA	NA	NA	NA	<2.7	NA
2-Chlorophenol	ug/L	24	(c)	NA	NA	NA	NA	NA	NA	<4.7	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	NA	NA	NA	NA	<0.39	NA
2-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	NA	<2.3	NA
2-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	NA	<3.6	NA
2-Nitrophenol	ug/L	--		NA	NA	NA	NA	NA	NA	<5.2	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	NA	NA	NA	NA	<3.2	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	NA	<2.2	NA
3-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	NA	<2.6	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	NA	NA	NA	NA	<9.1	NA
4-Bromophenyl-phenylether	ug/L	--		NA	NA	NA	NA	NA	NA	<2.6	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	NA	NA	NA	NA	<4.4	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-31	OB-32	PM AIR SHAFT	PM AIR SHAFT	PM AIR SHAFT	RW-2	RW-2	RW-2
Sample Depth():				- -	- -	50	180	230	279 - 289	279 - 289	452 - 462
Date Collected:				42397.00	42397.00	41898.00	41898.00	41899.00	41908.00	42237.00	41908.00
Sample Name:	Units	Chronic	Note	OB-31-012816	OB-32-012816	PMAIRSHAFT-50(091614)	PMAIRSHAFT-180(091614)	PMAIRSHAFT-230(091714)	RW-2(279-289)(092614)	RW-2-(279-289)-082115	RW-2(452-462)(092614)
4-Chloroaniline	ug/L	--		NA	NA	NA	NA	NA	NA	<4.1	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	NA	NA	NA	NA	<2.7	NA
4-Nitroaniline	ug/L	--		NA	NA	NA	NA	NA	NA	<3	NA
4-Nitrophenol	ug/L	60	(c)	NA	NA	NA	NA	NA	NA	<5.3	NA
Acenaphthene	ug/L	38	(c)	NA	NA	NA	NA	0.191	NA	<0.31	NA
Acenaphthylene	ug/L	4840	(c)	NA	NA	NA	NA	NA	NA	<0.34	NA
Acetophenone	ug/L	--		NA	NA	NA	NA	NA	NA	<2.3	1.6
Anthracene	ug/L	0.035	(c)	NA	NA	NA	NA	NA	NA	<0.37	NA
Atrazine	ug/L	--		NA	NA	NA	NA	NA	NA	<2.8	NA
Benzaldehyde	ug/L	--		NA	NA	NA	NA	NA	NA	<5.6	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	NA	NA	NA	NA	R	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	NA	NA	NA	NA	R	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	NA	NA	NA	NA	R	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	NA	NA	NA	NA	<0.61	NA
Benzo(k)fluoranthene	ug/L	--		NA	NA	NA	NA	NA	NA	<0.36	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	NA	NA	NA	NA	<3	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	NA	NA	NA	NA	<2.7	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	NA	NA	NA	39.2	NA	<5.9	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	NA	NA	NA	NA	<2.5	NA
Caprolactam	ug/L	--		NA	NA	NA	NA	NA	NA	<2.4	NA
Carbazole	ug/L	--		NA	NA	NA	NA	NA	NA	<2.7	NA
Chrysene	ug/L	--		NA	NA	NA	NA	NA	NA	<0.32	NA
Cyclohexane	ug/L	--		<0.26	0.28 J	NA	NA	NA	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	NA	NA	NA	NA	<0.44	NA
Dibenzofuran	ug/L	--		NA	NA	NA	NA	NA	NA	<2.8	NA
Diethylphthalate	ug/L	110	(c)	NA	NA	NA	NA	NA	NA	<2.9	NA
Dimethylphthalate	ug/L	--		NA	NA	NA	NA	NA	NA	<3	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	NA	NA	NA	NA	NA	<2.5	NA
Di-n-Octylphthalate	ug/L	--		NA	NA	NA	NA	5.6	NA	<2.5	NA
Diphenyl ether	ug/L	--		NA	NA	NA	NA	NA	NA	<2.2	NA
Fluoranthene	ug/L	1.9	(c)	NA	NA	NA	NA	NA	NA	<0.31	NA
Fluorene	ug/L	19	(c)	NA	NA	NA	NA	0.106	NA	<0.31	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	NA	NA	NA	NA	R	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	NA	NA	NA	NA	R	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	NA	NA	NA	NA	<1.8	NA
Hexachloroethane	ug/L	8	(c)	NA	NA	NA	NA	NA	NA	<1.9	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	NA	NA	NA	NA	<0.4	NA
Isophorone	ug/L	920	(c)	NA	NA	NA	NA	NA	NA	<3	NA
Naphthalene	ug/L	13	(c)	NA	NA	NA	0.726	3.26	NA	<0.36	NA
Nitrobenzene	ug/L	220	(c)	NA	NA	NA	NA	NA	NA	<2.6	NA
N-Nitrosodimethylamine	ug/L	--		NA	NA	NA	NA	NA	NA	R	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	NA	NA	NA	NA	<3.3	NA
N-Nitrosodiphenylamine	ug/L	--		NA	NA	NA	0.82	1.1	NA	<3.5	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-31	OB-32	PM AIR SHAFT	PM AIR SHAFT	PM AIR SHAFT	RW-2	RW-2	RW-2
Sample Depth():				- -	- -	50	180	230	279 - 289	279 - 289	452 - 462
Date Collected:				42397.00	42397.00	41898.00	41898.00	41899.00	41908.00	42237.00	41908.00
Sample Name:	Units	Chronic	Note	OB-31-012816	OB-32-012816	PMAIRSHAFT-50(091614)	PMAIRSHAFT-180(091614)	PMAIRSHAFT-230(091714)	RW-2(279-289)(092614)	RW-2-(279-289)-082115	RW-2(452-462)(092614)
Pentachlorophenol	ug/L	--		NA	NA	NA	NA	NA	NA	R	NA
Phenanthrene	ug/L	3.6	(c)	NA	NA	NA	NA	NA	0.274	<0.41	0.335
Phenol	ug/L	180	(c)	NA	NA	NA	NA	NA	NA	1.7 J	15.1
Pyrene	ug/L	0.3	(c)	NA	NA	NA	NA	NA	NA	<0.34	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	NA	42.1	163	66.1	344	250	169
Antimony	ug/L	80	(c)	NA	NA	NA	NA	NA	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	4.20	5.20	1.90 J	8.30
Barium	ug/L	220	(c)	NA	NA	8.80	369	542	41.7	32.0	50.2
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	NA	NA	5,090	36,700	95,400	131,000	132,000	112,000
Chromium	ug/L	42	(c)	NA	NA	NA	4.80	4.10	1.40	<0.500	NA
Cobalt	ug/L	24	(c)	NA	NA	NA	NA	NA	NA	<0.500	NA
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	NA	NA	<0.500	307
Iron	ug/L	--	(j)	NA	NA	NA	68,100	127,000	NA	15.0 J	40.0
Lead	ug/L	5.4	(d) (e)	NA	NA	NA	13.3	3.40	NA	<0.200	5.80
Magnesium	ug/L	--	(j)	NA	NA	1,430	3,650	10,800	NA	<130	NA
Manganese	ug/L	120	(i)	5,920	8,750	6.20	709	2,300	NA	<0.500	NA
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	NA	NA	NA	2.00	1.30	3.50	2.90	10.0
Potassium	ug/L	--	(j)	NA	NA	505	1,700	8,610	36,700	23,600	89,900
Selenium	ug/L	5	(d)	NA	NA	NA	NA	NA	NA	0.860 J	5.20
Silver	ug/L	0.12	(c)	NA	NA	NA	NA	NA	1.70	<0.500	3.40
Sodium	ug/L	--	(j)	NA	NA	2,620	4,630	34,200	130,000	134,000	338,000
Thallium	ug/L	10	(c)	NA	NA	NA	NA	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	NA	NA	13.8	6.30	15.6	18.0	38.6
Zinc	ug/L	71.69	(a)	NA	NA	1,540	9,230	1,190	NA	<10.0	156
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	NA	26.9	31.0	95.1	360	250	158
Antimony	ug/L	80	(c)	NA	NA	NA	NA	NA	NA	0.690 J	NA
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	4.90	4.10	2.10	7.20
Barium	ug/L	220	(c)	NA	NA	8.50	333	326	39.5	38.0	47.8
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	NA	NA	5,000	37,000	99,500	126,000	134,000	110,000
Chromium	ug/L	42	(c)	NA	NA	NA	NA	2.00	NA	<0.500	0.900
Cobalt	ug/L	24	(c)	NA	NA	NA	NA	NA	NA	<0.500	NA
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	NA	NA	0.550 J	NA
Iron	ug/L	--	(j)	NA	NA	87.2	51,600	94,500	NA	<10.0	19.5
Lead	ug/L	5.4	(d) (e)	NA	NA	NA	1.50	2.20	NA	<0.200	1.80
Magnesium	ug/L	--	(j)	NA	NA	1,370	3,610	12,000	NA	<130	NA
Manganese	ug/L	120	(i)	NA	NA	4.60	725	2,200	NA	0.500 J	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		OB-31	OB-32	PM AIR SHAFT	PM AIR SHAFT	PM AIR SHAFT	RW-2	RW-2	RW-2
Sample Depth():				- -	- -	50	180	230	279 - 289	279 - 289	452 - 462
Date Collected:				42397.00	42397.00	41898.00	41898.00	41899.00	41908.00	42237.00	41908.00
Sample Name:	Units	Chronic	Note	OB-31-012816	OB-32-012816	PMAIRSHAFT-50(091614)	PMAIRSHAFT-180(091614)	PMAIRSHAFT-230(091714)	RW-2(279-289)(092614)	RW-2-(279-289)-082115	RW-2(452-462)(092614)
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	NA	NA	NA	NA	NA	3.20	3.20	9.40
Potassium	ug/L	--	(j)	NA	NA	465	1,790	7,850	33,700	25,100	92,100
Selenium	ug/L	5	(d)	NA	NA	NA	NA	NA	NA	0.690 J	6.20
Silver	ug/L	0.12	(c)	NA	NA	NA	NA	3.30	2.20	<0.500	3.40
Sodium	ug/L	--	(j)	NA	NA	2,410	4,690	31,600	129,000	125,000	342,000
Thallium	ug/L	10	(c)	NA	NA	NA	NA	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	NA	NA	6.40	NA	14.9	17.0	38.6
Zinc	ug/L	71.69	(a)	NA	NA	1,560	6,720	940	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		111,000	195,000	18,500	114,000	443,000	138,000	104,000	98,400
Alkalinity, Bicarbonate	ug/L	--		NA	NA	NA	NA	NA	NA	<5,000	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		2,060	2,230	NA	3,000	10,800	230,000	194,000	551,000
Cyanide	ug/L	--		NA	NA	NA	NA	NA	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		6,000	8,200	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		<26	99 J	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		69 J	75 J	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		1,930	680	NA	NA	NA	156,000	176,000	170,000
Sulfide	ug/L	--		<820	<820	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		440 B	1,600	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		2,400	3,200	NA	NA	NA	NA	NA	NA

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-2 452 - 462 42241.00 RW-2-(452-462)-082515	RW-3 77 - 87 41897.00 RW-3(77-87)(091514)	RW-3 77 - 87 42222.00 RW-3-(77-87)-080615	RW-3 77 - 87 42356.00 RW-3-121815	RW-3DD 175 - 180 41894.00 RW-3DD(175-180)(091214)	RW-3DD 175 - 185 42226.00 RW-3DD-(175-180)-081015	RW-3DD 175 - 185 42355.00 RW-3DD-121715	RW-3DS 155 - 160 41893.00 RW-3DS(155-160)(091114)
PCBs											
Aroclor-1016	ug/L	--		NA	NA	<0.57	NA	NA	<0.43	NA	NA
Aroclor-1221	ug/L	--		NA	NA	<0.45	NA	NA	<0.34	NA	NA
Aroclor-1232	ug/L	--		NA	NA	<0.53	NA	NA	<0.4	NA	NA
Aroclor-1242	ug/L	--		NA	NA	<0.29	NA	NA	<0.22	NA	NA
Aroclor-1248	ug/L	--		NA	NA	<0.2	NA	NA	<0.15	NA	NA
Aroclor-1254	ug/L	--		NA	NA	<0.22	NA	NA	<0.17	NA	NA
Aroclor-1260	ug/L	--		NA	NA	<0.24	NA	NA	<0.18	NA	NA
Total PCBs	ug/L	--		NA	NA	<0.66	NA	NA	<0.43	NA	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	NA	<0.19	<0.28	NA	<0.19	<0.28	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	<0.19	<0.19	NA	<0.19	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	NA	<0.15	<0.34	NA	<0.15	<0.34	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	NA	<0.19	<0.08	NA	<0.19	<0.08	NA
1,1-Dichloroethane	ug/L	--		<0.24	NA	0.26 J	0.32 J	1.4	1.9	2	1
1,1-Dichloroethene	ug/L	65	(c)	<0.25	NA	<0.25	<0.34	NA	<0.25	<0.34	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	NA	<2.1	NA	NA	<0.55	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	NA	<0.01	<0.007	NA	<0.01	<0.007	NA
1,2-Dibromoethane	ug/L	--		<0.01	NA	<0.01	<0.006	NA	<0.01	<0.006	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	NA	<0.19	<0.22	NA	<0.19	<0.22	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.2	NA	<0.2	0.26 J	NA	<0.2	<0.25	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.25	NA	<0.25	<0.18	NA	<0.25	<0.18	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	NA	<0.18	<0.33	NA	<0.18	<0.33	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	NA	<0.17	<0.33	NA	<0.17	<0.33	NA
2-Butanone	ug/L	--		<2.6	NA	<2.6	<2.2	9	5.5 J	2.9 J	NA
2-Hexanone	ug/L	--		<1.3	NA	<1.3	<0.72	NA	<1.3	<0.72	NA
4-Methyl-2-pentanone	ug/L	--		<0.81	NA	<0.81	<0.63	NA	<0.81	<0.63	NA
Acetone	ug/L	--		16 J	NA	<2.7	<1.1	9	12 J	7.6	26.8
Bromochloromethane	ug/L	--		NA	NA	NA	<0.3	NA	NA	<0.3	NA
Bromodichloromethane	ug/L	--		<0.17	NA	<0.17	<0.15	NA	<0.17	<0.15	NA
Bromoform	ug/L	230	(c)	<0.29	NA	<0.29	<0.18	NA	<0.29	<0.18	NA
Bromomethane	ug/L	16	(c)	<0.35	NA	<0.35	<0.18	NA	<0.35	<0.18	NA
Carbon Disulfide	ug/L	--		1.8	NA	<0.22	1	7.1	3.7	2	23.8
Carbon Tetrachloride	ug/L	240	(c)	<0.18	NA	<0.18	<0.33	NA	<0.18	<0.33	NA
Chlorobenzene	ug/L	47	(c)	<0.18	NA	<0.18	<0.24	NA	<0.18	<0.24	NA
Chloroethane	ug/L	--		<0.36	NA	<0.36	<0.37	NA	<0.36	<0.37	NA
Chloroform	ug/L	140	(c)	<0.23	NA	<0.23	<0.22	NA	<0.23	<0.22	NA
Chloromethane	ug/L	--		<0.36	NA	<0.36	<0.22 J	NA	<0.36	<0.22 J	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	NA	<0.21	<0.26	NA	0.22 J	<0.26	NA
cis-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	<0.16	NA	<0.17	<0.16	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	NA	<0.25	<0.22	NA	<0.25	<0.22	NA

Appendix A
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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-2	RW-3	RW-3	RW-3	RW-3DD	RW-3DD	RW-3DD	RW-3DS
Sample Depth():				452 - 462	77 - 87	77 - 87	77 - 87	175 - 180	175 - 185	175 - 185	155 - 160
Date Collected:				42241.00	41897.00	42222.00	42356.00	41894.00	42226.00	42355.00	41893.00
Sample Name:	Units	Chronic	Note	RW-2-(452-462)-082515	RW-3(77-87)(091514)	RW-3-(77-87)-080615	RW-3-121815	RW-3DD(175-180)(091214)	RW-3DD-(175-180)-081015	RW-3DD-121715	RW-3DS(155-160)(091114)
Dichlorodifluoromethane	ug/L	--		0.19 J	NA	<0.17	<0.14	NA	<0.17	<0.14	NA
Isopropylbenzene	ug/L	--		<0.33	NA	<0.33	<0.32	NA	<0.33	<0.32	NA
Methyl acetate	ug/L	--		<0.58 J	NA	<0.58	<0.58 J	NA	<0.58	<0.58 J	NA
Methylcyclohexane	ug/L	--		<0.09	NA	<0.09	<0.22	NA	<0.09	<0.22	NA
Methylene Chloride	ug/L	940	(c)	<0.22	NA	<0.22	<0.21	NA	<0.22	<0.21	NA
Styrene	ug/L	32	(c)	<0.28	NA	<0.28	<0.17	NA	<0.28	<0.17	NA
Tetrachloroethene	ug/L	45	(c)	<0.14	NA	<0.14	<0.12	NA	<0.14	<0.12	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	NA	<0.23	<0.18	NA	<0.23	<0.18	NA
trans-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	<0.19	NA	<0.17	<0.19	NA
Trichloroethene	ug/L	47	(c)	<0.2	NA	<0.2	<0.22	NA	<0.2	<0.22	NA
Trichlorofluoromethane	ug/L	--		<0.21	NA	<0.21	<0.15	NA	<0.21	<0.15	NA
Vinyl Chloride	ug/L	930	(c)	<0.18	NA	<0.18	<0.06	NA	<0.18	<0.06	NA
Benzene	ug/L	114	(c)	0.24 J	NA	<0.2	<0.09	1.1	0.44 J	0.25 J	NA
Toluene	ug/L	253	(c)	0.71 J	NA	<0.17	<0.25	NA	<0.17	<0.25	1
Ethylbenzene	ug/L	14	(c)	<0.19	NA	<0.19	<0.3	NA	<0.19	<0.3	0.5
Xylenes (total)	ug/L	27	(c)	<0.58	NA	<0.58	<0.28	NA	<0.58	<0.28	1.2
Methyl tert-butyl ether	ug/L	51000	(f)	0.3 J	NA	<0.17	<0.13	NA	<0.17	0.15 J	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	<0.35	NA	NA	<0.35	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.01	NA	NA	<0.01	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	NA	<0.2	<0.27	NA	<0.2	<0.27	NA
1,4-Dioxane	ug/L	22000	(k)	4.7 J	NA	22	8.27	NA	20	8.95	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	NA	<2.8	NA	NA	<0.74	NA	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	NA	<6.9	NA	NA	<1.8	NA	NA
2,4,5-Trichlorophenol	ug/L	--		<7.1	NA	<7.1	NA	NA	<1.9	NA	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	NA	<6.8	NA	NA	<1.8	NA	NA
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	NA	<5.6	NA	NA	<1.5	NA	NA
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	NA	<4.2	NA	NA	<1.1	NA	NA
2,4-Dinitrophenol	ug/L	19	(c)	6.5 J	NA	<5.9	NA	NA	<1.6	NA	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	NA	<3.2	NA	NA	<0.84	NA	NA
2,6-Dinitrotoluene	ug/L	--		<2.3	NA	<2.3	NA	NA	<0.61	NA	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	NA	<2.8	NA	NA	<0.74	NA	NA
2-Chlorophenol	ug/L	24	(c)	<4.8	NA	<4.8	NA	NA	<1.3	NA	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.4	NA	<0.4	NA	NA	<0.11	NA	NA
2-Methylphenol	ug/L	--		<2.3	NA	<2.3	NA	NA	<0.61	NA	NA
2-Nitroaniline	ug/L	--		<3.7	NA	<3.7	NA	NA	<0.97	NA	NA
2-Nitrophenol	ug/L	--		<5.3	NA	<5.3	NA	NA	<1.4	NA	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	NA	<3.3	NA	NA	<0.87	NA	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	NA	<2.2	NA	NA	<0.58	NA	NA
3-Nitroaniline	ug/L	--		<2.7	NA	<2.7	NA	NA	<0.71	NA	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	NA	<9.3	NA	NA	<2.4	NA	NA
4-Bromophenyl-phenylether	ug/L	--		<2.7	NA	<2.7	NA	NA	<0.71	NA	NA
4-Chloro-3-Methylphenol	ug/L	--		<4.5	NA	<4.5	NA	NA	<1.2	NA	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-2	RW-3	RW-3	RW-3	RW-3DD	RW-3DD	RW-3DD	RW-3DS
Sample Depth():				452 - 462	77 - 87	77 - 87	77 - 87	175 - 180	175 - 185	175 - 185	155 - 160
Date Collected:				42241.00	41897.00	42222.00	42356.00	41894.00	42226.00	42355.00	41893.00
Sample Name:	Units	Chronic	Note	RW-2-(452-462)-082515	RW-3(77-87)(091514)	RW-3-(77-87)-080615	RW-3-121815	RW-3DD(175-180)(091214)	RW-3DD-(175-180)-081015	RW-3DD-121715	RW-3DS(155-160)(091114)
4-Chloroaniline	ug/L	--		<4.2	NA	<4.2	NA	NA	<1.1	NA	NA
4-Chlorophenyl-phenylether	ug/L	--		<2.8	NA	<2.8	NA	NA	<0.74	NA	NA
4-Nitroaniline	ug/L	--		<3.1	NA	<3.1	NA	NA	<0.82	NA	NA
4-Nitrophenol	ug/L	60	(c)	<5.4	NA	<5.4	NA	NA	<1.4	NA	NA
Acenaphthene	ug/L	38	(c)	<0.32	NA	<0.32	NA	NA	<0.084	NA	NA
Acenaphthylene	ug/L	4840	(c)	<0.35	NA	<0.35	NA	NA	<0.092	NA	NA
Acetophenone	ug/L	--		<2.3	NA	<2.3	NA	NA	<0.61	NA	0.83
Anthracene	ug/L	0.035	(c)	<0.38	NA	<0.38	NA	NA	<0.1	NA	NA
Atrazine	ug/L	--		<2.9	NA	<2.9	NA	NA	<0.76	NA	NA
Benzaldehyde	ug/L	--		<5.7	NA	<5.7	NA	NA	<1.5	NA	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	<0.025	NA	NA	<0.025	NA	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	<0.025	NA	NA	<0.025	NA	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	<0.025	NA	NA	<0.025	NA	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	NA	<0.62	NA	NA	<0.16	NA	NA
Benzo(k)fluoranthene	ug/L	--		<0.37	NA	<0.37	NA	NA	<0.097	NA	NA
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	NA	<3.1	NA	NA	<0.82	NA	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	NA	<2.8	NA	NA	<0.74	NA	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	NA	<6	NA	NA	2.8 B	NA	NA
Butylbenzylphthalate	ug/L	23	(c)	<2.5	NA	<2.5	NA	NA	<0.66	NA	NA
Caprolactam	ug/L	--		<2.4	NA	<2.4	NA	NA	<0.63	NA	NA
Carbazole	ug/L	--		<2.8	NA	<2.8	NA	NA	<0.74	NA	NA
Chrysene	ug/L	--		<0.33	NA	<0.33	NA	NA	<0.087	NA	NA
Cyclohexane	ug/L	--		<0.13	NA	<0.13	<0.26	NA	<0.13	<0.26	NA
Dibenzo(a,h)anthracene	ug/L	--		<0.45	NA	<0.45	NA	NA	<0.12	NA	NA
Dibenzofuran	ug/L	--		<2.9	NA	<2.9	NA	NA	<0.76	NA	NA
Diethylphthalate	ug/L	110	(c)	<3	NA	<3	NA	NA	<0.79	NA	NA
Dimethylphthalate	ug/L	--		<3.1	NA	<3.1	NA	NA	<0.82	NA	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	NA	<2.5	NA	NA	<0.66	NA	NA
Di-n-Octylphthalate	ug/L	--		<2.5	NA	<2.5	NA	NA	<0.66	NA	NA
Diphenyl ether	ug/L	--		<2.2	NA	<2.2	NA	NA	<0.58	NA	NA
Fluoranthene	ug/L	1.9	(c)	<0.32	NA	<0.32	NA	NA	<0.084	NA	NA
Fluorene	ug/L	19	(c)	<0.32	NA	<0.32	NA	NA	<0.084	NA	0.133
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	<0.014	NA	NA	<0.014	NA	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	<0.2	NA	NA	<0.2	NA	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	NA	<1.8	NA	NA	<0.47	NA	NA
Hexachloroethane	ug/L	8	(c)	<1.9	NA	<1.9	NA	NA	<0.5	NA	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	NA	<0.41	NA	NA	<0.11	NA	NA
Isophorone	ug/L	920	(c)	<3.1	NA	<3.1	NA	0.76	<0.82	NA	NA
Naphthalene	ug/L	13	(c)	<0.37	NA	<0.37	NA	0.165	<0.097	NA	NA
Nitrobenzene	ug/L	220	(c)	<2.7	NA	<2.7	NA	NA	<0.71	NA	NA
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	<0.2	NA	NA	<0.2	NA	NA
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	NA	<3.4	NA	NA	<0.89	NA	NA
N-Nitrosodiphenylamine	ug/L	--		<3.6	NA	<3.6	NA	NA	<0.95	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-2 452 - 462 42241.00 RW-2-(452-462)-082515	RW-3 77 - 87 41897.00 RW-3(77-87)(091514)	RW-3 77 - 87 42222.00 RW-3-(77-87)-080615	RW-3 77 - 87 42356.00 RW-3-121815	RW-3DD 175 - 180 41894.00 RW-3DD(175-180)(091214)	RW-3DD 175 - 185 42226.00 RW-3DD-(175-180)-081015	RW-3DD 175 - 185 42355.00 RW-3DD-121715	RW-3DS 155 - 160 41893.00 RW-3DS(155-160)(091114)
Pentachlorophenol	ug/L	--		<0.1	NA	<0.1	NA	NA	<0.1	NA	NA
Phenanthrene	ug/L	3.6	(c)	<0.42	NA	<0.42	NA	NA	<0.11	NA	0.5
Phenol	ug/L	180	(c)	10	NA	<1.5	NA	5.4	3.6	NA	10.6
Pyrene	ug/L	0.3	(c)	<0.35	NA	<0.35	NA	NA	<0.092	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	100	62.1	13.0 J	NA	142	110	NA	96.1
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	NA	<0.500	NA	NA
Arsenic	ug/L	150	(d) (e)	5.40	NA	<0.880 B	NA	13.6	20.0	NA	9.60
Barium	ug/L	220	(c)	59.0	49.3	50.0	NA	6.50	6.40	NA	13.6
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	NA	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	NA	<0.400	NA	NA
Calcium	ug/L	--	(j)	132,000	58,300	58,800	NA	17,700	21,800	NA	35,600
Chromium	ug/L	42	(c)	0.580 J	NA	<0.500	NA	NA	<0.500	NA	NA
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	NA	NA	<0.500	NA	NA
Copper	ug/L	5.56	(a)	1.00 J	2.90	0.900 J	NA	NA	<0.500	NA	NA
Iron	ug/L	--	(j)	21.0 J	113	82.0	NA	178	14.0 J	NA	NA
Lead	ug/L	5.4	(d) (e)	0.200 J	NA	0.260 J	NA	NA	<0.200	NA	NA
Magnesium	ug/L	--	(j)	<130	15,300	15,600	NA	3,070	720 J	NA	NA
Manganese	ug/L	120	(i)	<0.500	80.9	96.0	91.3	NA	0.990 J	3.10 J	NA
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	NA	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	8.30	23.3	9.40	NA	6.40	3.50	NA	17.1
Potassium	ug/L	--	(j)	103,000	2,760	2,300	NA	9,020	12,500	NA	70,000
Selenium	ug/L	5	(d)	3.60	NA	<0.600	NA	3.90	<0.600	NA	10.1
Silver	ug/L	0.12	(c)	<0.500	NA	<0.500	NA	3.50	<0.500	NA	6.90
Sodium	ug/L	--	(j)	371,000	7,720	7,700	NA	51,700	53,700	NA	232,000
Thallium	ug/L	10	(c)	0.510 J	NA	<0.200	NA	NA	<0.200	NA	NA
Vanadium	ug/L	12	(c)	40.0	0.900	2.00 B	NA	6.00	7.90	NA	9.20
Zinc	ug/L	71.69	(a)	<10.0	NA	16.0 J	NA	23.3	<10.0	NA	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	140	51.3	<9.60	NA	378	99.0	NA	111
Antimony	ug/L	80	(c)	<2.50	NA	<0.500	NA	NA	<0.500	NA	NA
Arsenic	ug/L	150	(d) (e)	5.60 J	NA	<0.500	NA	18.7	19.0	NA	11.8
Barium	ug/L	220	(c)	70.0	46.3	45.0	NA	8.30	6.80	NA	15.7
Beryllium	ug/L	3.6	(c)	<2.50	NA	<0.500	NA	NA	<0.500	NA	NA
Cadmium	ug/L	0.17	(a)	<2.00	NA	<0.400	NA	NA	<0.400	NA	NA
Calcium	ug/L	--	(j)	145,000	56,900	57,400	NA	14,900	22,500	NA	45,300
Chromium	ug/L	42	(c)	<2.50	NA	<0.500	NA	NA	<0.500	NA	NA
Cobalt	ug/L	24	(c)	<2.50	NA	<0.500	NA	NA	<0.500	NA	NA
Copper	ug/L	5.56	(a)	<2.50	1.20	<0.500	NA	NA	<0.500	NA	NA
Iron	ug/L	--	(j)	<50.0	36.3	12.0 J	NA	143	17.0 J	NA	NA
Lead	ug/L	5.4	(d) (e)	<1.00	NA	<0.200	NA	NA	<0.200	NA	NA
Magnesium	ug/L	--	(j)	<630	15,200	15,700	NA	980	760 J	NA	NA
Manganese	ug/L	120	(i)	<2.50	75.8	93.0	NA	NA	1.50 J	NA	NA

Appendix A
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Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-2	RW-3	RW-3	RW-3	RW-3DD	RW-3DD	RW-3DD	RW-3DS
Sample Depth():				452 - 462	77 - 87	77 - 87	77 - 87	175 - 180	175 - 185	175 - 185	155 - 160
Date Collected:				42241.00	41897.00	42222.00	42356.00	41894.00	42226.00	42355.00	41893.00
Sample Name:	Units	Chronic	Note	RW-2-(452-462)-082515	RW-3(77-87)(091514)	RW-3-(77-87)-080615	RW-3-121815	RW-3DD(175-180)(091214)	RW-3DD-(175-180)-081015	RW-3DD-121715	RW-3DS(155-160)(091114)
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	NA	<0.150	NA	NA
Nickel	ug/L	31.24	(a)	8.80 J	11.8	6.90	NA	5.60	2.20	NA	NA
Potassium	ug/L	--	(j)	129,000	2,550	2,200	NA	9,520	11,700	NA	62,800
Selenium	ug/L	5	(d)	4.90 J	NA	<0.600	NA	8.00	<0.600	NA	10.0
Silver	ug/L	0.12	(c)	<2.50	NA	<0.500	NA	5.20	<0.500	NA	7.00
Sodium	ug/L	--	(j)	382,000	7,590	7,500	NA	57,600	51,200	NA	230,000
Thallium	ug/L	10	(c)	2.90 J	NA	<0.200	NA	NA	<0.200	NA	NA
Vanadium	ug/L	12	(c)	40.0	NA	2.00 B	NA	10.5	7.00	NA	10.4
Zinc	ug/L	71.69	(a)	<50.0	NA	<10.0	NA	17.5	<10.0	NA	NA
Miscellaneous											
Alkalinity	ug/L	--		127,000	196,000	202,000	220,000	103,000	96,800	80,100	103,000
Alkalinity, Bicarbonate	ug/L	--		<5,000	NA	202,000	NA	NA	<5,000	NA	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	<81	NA	NA	330 J	NA
Chloride	ug/L	--		601,000 J	8,900	2,190,000	6,840	11,300	8,430	10,300	46,000
Cyanide	ug/L	--		<7 J	NA	<7	NA	NA	<7	NA	NA
Fluoride, Total	ug/L	--		NA	NA	NA	<15	NA	NA	<15	NA
Methane	ug/L	--		NA	NA	NA	70	NA	NA	73	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	<21	NA	NA	99 J	NA
Nitrate-N	ug/L	--		NA	NA	NA	<21	NA	NA	<21	NA
Nitrite	ug/L	--		NA	NA	NA	<29	NA	NA	99 J	NA
Sulfate	ug/L	--		167,000 J	NA	139,000	5,540	42,900	39,500	41,100	472,000
Sulfide	ug/L	--		NA	NA	NA	<820	NA	NA	<820	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	<140	NA	NA	680	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	350 J	NA	NA	4,300	NA

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-3DS 155 - 160 42241.00 DUP-04-082515	RW-3DS 155 - 160 42241.00 RW-3DS-(155-160)-082515	RW-3DS 155 - 160 42355.00 RW-3DS-121715	RW-4 333 - 343 41891.00 RW-4(333-343)(090914)	RW-4 333 - 343 42240.00 RW-4-(333-343)-082415	RW-4 393 - 403 41892.00 RW-4(393-403)(091014)	RW-4 393 - 403 42226.00 RW-4-(393-403)-081015	RW-4A 62 - 72 41892.00 RW-4A(62-72)(091014)
PCBs											
Aroclor-1016	ug/L	--		<0.43	<0.43	NA	NA	<0.43	NA	<0.43	NA
Aroclor-1221	ug/L	--		<0.34	<0.34	NA	NA	<0.34	NA	<0.34	NA
Aroclor-1232	ug/L	--		<0.4	<0.4	NA	NA	<0.4	NA	<0.4	NA
Aroclor-1242	ug/L	--		<0.22	<0.22	NA	NA	<0.22	NA	<0.22	NA
Aroclor-1248	ug/L	--		<0.15	<0.15	NA	NA	<0.15	NA	<0.15	NA
Aroclor-1254	ug/L	--		<0.17	<0.17	NA	NA	<0.17	NA	<0.17	NA
Aroclor-1260	ug/L	--		<0.18	<0.18	NA	NA	<0.18	NA	<0.18	NA
Total PCBs	ug/L	--		<0.43	<0.43	NA	NA	<0.43	NA	<0.43	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	<0.19	<0.28	NA	<0.19	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	<0.19	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	<0.15	<0.34	NA	<0.15	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	<0.19	<0.08	NA	<0.19	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		1	1	1.8	NA	<0.24	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	<0.25	<0.25	<0.34	NA	<0.25	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	<2.1	NA	NA	<2.1	NA	<0.53	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	<0.01	<0.007	NA	<0.01	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		<0.01	<0.01	<0.006	NA	<0.01	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.19	<0.22	NA	<0.19	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.2	<0.2	0.27 J	NA	<0.2	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.25	<0.25	<0.18	NA	<0.25	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	<0.18	<0.33	NA	<0.18	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	<0.17	<0.33	NA	<0.17	NA	<0.17	NA
2-Butanone	ug/L	--		<2.6	<2.6	<2.2	NA	<2.6	NA	<2.6	NA
2-Hexanone	ug/L	--		<1.3	<1.3	<0.72	NA	<1.3	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		<0.81	<0.81	<0.63	NA	<0.81	NA	<0.81	NA
Acetone	ug/L	--		<3 B	<2.7	11	NA	<2.7	NA	<2.7	NA
Bromochloromethane	ug/L	--		NA	NA	<0.3	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.17	<0.17	<0.15	NA	<0.17	NA	<0.17	NA
Bromoform	ug/L	230	(c)	<0.29	<0.29	<0.18	NA	<0.29	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	<0.35	<0.35	<0.18	NA	<0.35	NA	<0.35	NA
Carbon Disulfide	ug/L	--		12	11	11	NA	<0.22	NA	<0.22	NA
Carbon Tetrachloride	ug/L	240	(c)	<0.18	<0.18	<0.33	NA	<0.18	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	<0.18	<0.18	<0.24	NA	<0.18	NA	<0.18	NA
Chloroethane	ug/L	--		<0.36	<0.36	<0.37	NA	<0.36	NA	<0.36	NA
Chloroform	ug/L	140	(c)	<0.23	<0.23	<0.22	NA	<0.23	NA	<0.23	NA
Chloromethane	ug/L	--		<0.36	<0.36	<0.22 J	0.46	<0.36 J	NA	<0.36	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	<0.21	<0.26	NA	<0.21	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		<0.17	<0.17	<0.16	NA	<0.17	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	<0.25	<0.22	NA	<0.25	NA	<0.25	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-3DS	RW-3DS	RW-3DS	RW-4	RW-4	RW-4	RW-4	RW-4A
Sample Depth():				155 - 160	155 - 160	155 - 160	333 - 343	333 - 343	393 - 403	393 - 403	62 - 72
Date Collected:				42241.00	42241.00	42355.00	41891.00	42240.00	41892.00	42226.00	41892.00
Sample Name:	Units	Chronic	Note	DUP-04-082515	RW-3DS-(155-160)-082515	RW-3DS-121715	RW-4(333-343)(090914)	RW-4-(333-343)-082415	RW-4(393-403)(091014)	RW-4-(393-403)-081015	RW-4A(62-72)(091014)
Dichlorodifluoromethane	ug/L	--		<0.17	<0.17	<0.14	NA	<0.17	NA	<0.17	NA
Isopropylbenzene	ug/L	--		<0.33	<0.33	<0.32	NA	<0.33	NA	<0.33	NA
Methyl acetate	ug/L	--		<0.58 J	<0.58 J	<0.58 J	NA	<0.58 J	NA	<0.58	NA
Methylcyclohexane	ug/L	--		<0.09	<0.09	<0.22	NA	<0.09	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	<0.22	<0.22	<0.21	NA	<0.22	NA	<0.22	NA
Styrene	ug/L	32	(c)	<0.28	<0.28	<0.17	NA	<0.28	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	<0.14	<0.14	<0.12	NA	<0.14	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	<0.23	<0.18	NA	<0.23	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		<0.17	<0.17	<0.19	NA	<0.17	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	<0.2	<0.2	<0.22	NA	<0.2	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		<0.21	<0.21	<0.15	NA	<0.21	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	<0.18	<0.18	<0.06	NA	<0.18	NA	<0.18	NA
Benzene	ug/L	114	(c)	<0.2	<0.2	0.12 J	NA	<0.2	NA	<0.2	NA
Toluene	ug/L	253	(c)	0.48 J	0.6 J	<0.25	NA	<0.17	NA	<0.17	NA
Ethylbenzene	ug/L	14	(c)	0.23 J	0.26 J	<0.3	NA	<0.19	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	<0.58	<0.58	<0.28	NA	<0.58	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	<0.17	<0.13	NA	<0.17	NA	<0.17	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	<0.35	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	<0.01	NA	NA	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	<0.2	<0.27	NA	<0.2	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	36 J	38 J	5.25	NA	<0.27	NA	<0.27	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	<2.8	NA	NA	<2.8 J	NA	<0.7	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	<6.9	NA	NA	<6.9	NA	<1.7	NA
2,4,5-Trichlorophenol	ug/L	--		<7.1	<7.1	NA	NA	<7.1	NA	<1.8	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	<6.8	NA	NA	<6.8	NA	<1.7	NA
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	<5.6	NA	NA	<5.6	NA	<1.4	NA
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	<4.2	NA	NA	<4.2	NA	<1.1	NA
2,4-Dinitrophenol	ug/L	19	(c)	6.8 J	6.6 J	NA	NA	<5.9	NA	<1.5	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	<3.2	NA	NA	<3.2	NA	<0.8	NA
2,6-Dinitrotoluene	ug/L	--		<2.3	<2.3	NA	NA	<2.3	NA	<0.58	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	<2.8	NA	NA	<2.8	NA	<0.7	NA
2-Chlorophenol	ug/L	24	(c)	<4.8	<4.8	NA	NA	<4.8	NA	<1.2	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.4	<0.4	NA	NA	<0.4	NA	<0.1	NA
2-Methylphenol	ug/L	--		<2.3	<2.3	NA	NA	<2.3	NA	<0.58	NA
2-Nitroaniline	ug/L	--		<3.7	<3.7	NA	NA	<3.7	NA	<0.93	NA
2-Nitrophenol	ug/L	--		<5.3	<5.3	NA	NA	<5.3	NA	<1.3	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	<3.3	NA	NA	<3.3	NA	<0.83	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	<2.2	NA	NA	<2.2	NA	<0.55	NA
3-Nitroaniline	ug/L	--		<2.7	<2.7	NA	NA	<2.7	NA	<0.68	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	<9.3	NA	NA	<9.3	NA	<2.3	NA
4-Bromophenyl-phenylether	ug/L	--		<2.7	<2.7	NA	NA	<2.7	NA	<0.68	NA
4-Chloro-3-Methylphenol	ug/L	--		<4.5	<4.5	NA	NA	<4.5	NA	<1.1	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-3DS 155 - 160 42241.00 DUP-04-082515	RW-3DS 155 - 160 42241.00 RW-3DS-(155-160)-082515	RW-3DS 155 - 160 42355.00 RW-3DS-121715	RW-4 333 - 343 41891.00 RW-4(333-343)(090914)	RW-4 333 - 343 42240.00 RW-4-(333-343)-082415	RW-4 393 - 403 41892.00 RW-4(393-403)(091014)	RW-4 393 - 403 42226.00 RW-4-(393-403)-081015	RW-4A 62 - 72 41892.00 RW-4A(62-72)(091014)
4-Chloroaniline	ug/L	--		<4.2	<4.2	NA	NA	<4.2	NA	<1.1	NA
4-Chlorophenyl-phenylether	ug/L	--		<2.8	<2.8	NA	NA	<2.8	NA	<0.7	NA
4-Nitroaniline	ug/L	--		<3.1	<3.1	NA	NA	<3.1	NA	<0.78	NA
4-Nitrophenol	ug/L	60	(c)	<5.4	<5.4	NA	NA	<5.4	NA	<1.4	NA
Acenaphthene	ug/L	38	(c)	<0.32	<0.32	NA	NA	<0.32	NA	<0.08	NA
Acenaphthylene	ug/L	4840	(c)	<0.35	<0.35	NA	NA	<0.35	NA	<0.088	NA
Acetophenone	ug/L	--		<2.3	<2.3	NA	NA	<2.3	NA	<0.58	NA
Anthracene	ug/L	0.035	(c)	<0.38	<0.38	NA	NA	<0.38	NA	<0.095	NA
Atrazine	ug/L	--		<2.9	<2.9	NA	NA	<2.9	NA	<0.73	NA
Benzaldehyde	ug/L	--		<5.7	<5.7	NA	NA	<5.7	NA	<1.4	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	<0.025	NA	NA	<0.023	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	<0.025	NA	NA	<0.023	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	<0.025	NA	NA	<0.023	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	<0.62	NA	NA	<0.62	NA	<0.16	NA
Benzo(k)fluoranthene	ug/L	--		<0.37	<0.37	NA	NA	<0.37	NA	<0.093	NA
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	<3.1	NA	NA	<3.1	NA	<0.78	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	<2.8	NA	NA	<2.8	NA	<0.7	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	<6	NA	NA	<6	NA	<2.4 B	NA
Butylbenzylphthalate	ug/L	23	(c)	<2.5	<2.5	NA	NA	<2.5	NA	<0.63	NA
Caprolactam	ug/L	--		<2.4	<2.4	NA	NA	<2.4	NA	<0.6	NA
Carbazole	ug/L	--		<2.8	<2.8	NA	NA	<2.8	NA	<0.7	NA
Chrysene	ug/L	--		<0.33	<0.33	NA	NA	<0.33	NA	<0.083	NA
Cyclohexane	ug/L	--		<0.13	<0.13	<0.26	NA	<0.13	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		<0.45	<0.45	NA	NA	<0.45	NA	<0.11	NA
Dibenzofuran	ug/L	--		<2.9	<2.9	NA	NA	<2.9	NA	<0.73	NA
Diethylphthalate	ug/L	110	(c)	<3	<3	NA	NA	<3	NA	<0.75	NA
Dimethylphthalate	ug/L	--		<3.1	<3.1	NA	NA	<3.1	NA	<0.78	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	<2.5	NA	NA	<2.5	NA	<0.63	NA
Di-n-Octylphthalate	ug/L	--		<2.5	<2.5	NA	NA	<2.5	NA	<0.63	NA
Diphenyl ether	ug/L	--		<2.2	<2.2	NA	NA	<2.2	NA	<0.55	NA
Fluoranthene	ug/L	1.9	(c)	<0.32	<0.32	NA	NA	<0.32	NA	<0.08	NA
Fluorene	ug/L	19	(c)	<0.32	<0.32	NA	NA	<0.32	NA	<0.08	NA
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	<0.014	NA	NA	<0.013	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	<0.2	NA	NA	<0.19	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	<1.8	NA	NA	<1.8	NA	<0.45	NA
Hexachloroethane	ug/L	8	(c)	<1.9	<1.9	NA	NA	<1.9	NA	<0.48	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	<0.41	NA	NA	<0.41	NA	<0.1	NA
Isophorone	ug/L	920	(c)	<3.1	<3.1	NA	NA	<3.1	NA	<0.78	NA
Naphthalene	ug/L	13	(c)	<0.37	<0.37	NA	NA	<0.37	NA	<0.093	NA
Nitrobenzene	ug/L	220	(c)	<2.7	<2.7	NA	NA	<2.7	NA	<0.68	NA
N-Nitrosodimethylamine	ug/L	--		<0.2	<0.2	NA	NA	<0.19	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	<3.4	NA	NA	<3.4	NA	<0.85	NA
N-Nitrosodiphenylamine	ug/L	--		<3.6	<3.6	NA	NA	<3.6	NA	<0.9	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-3DS	RW-3DS	RW-3DS	RW-4	RW-4	RW-4	RW-4	RW-4A
Sample Depth():				155 - 160	155 - 160	155 - 160	333 - 343	333 - 343	393 - 403	393 - 403	62 - 72
Date Collected:				42241.00	42241.00	42355.00	41891.00	42240.00	41892.00	42226.00	41892.00
Sample Name:	Units	Chronic	Note	DUP-04-082515	RW-3DS-(155-160)-082515	RW-3DS-121715	RW-4(333-343)(090914)	RW-4-(333-343)-082415	RW-4(393-403)(091014)	RW-4-(393-403)-081015	RW-4A(62-72)(091014)
Pentachlorophenol	ug/L	--		<0.1	<0.1	NA	NA	<0.093	NA	<0.1	NA
Phenanthrene	ug/L	3.6	(c)	<0.42	<0.42	NA	0.126	<0.42	NA	<0.11	NA
Phenol	ug/L	180	(c)	2.7 J	3 J	NA	NA	<1.5	NA	<0.38	NA
Pyrene	ug/L	0.3	(c)	<0.35	<0.35	NA	NA	<0.35	NA	<0.088	NA
Inorganics											
Aluminum	ug/L	87	(i)	77.0	82.0	NA	807	860	29,200	1,600	54.6
Antimony	ug/L	80	(c)	<0.500	0.510 J	NA	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	12.0	12.0	NA	NA	0.900 J	9.60	0.590 J	NA
Barium	ug/L	220	(c)	13.0	13.0	NA	30.0	19.0	92.3	23.0	4.00
Beryllium	ug/L	3.6	(c)	<0.500	<0.500	NA	NA	<0.500	3.00	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	<0.400	NA	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	45,200	46,600	NA	53,600	51,400	36,800	23,500	9,020
Chromium	ug/L	42	(c)	3.20	3.50	NA	51.0	36.0	4.70	1.40 J	NA
Cobalt	ug/L	24	(c)	<0.500	<0.500	NA	NA	<0.500	1.80	<0.500	NA
Copper	ug/L	5.56	(a)	<0.500	<0.500	NA	3.20	1.10 J	4.90	1.30 J	NA
Iron	ug/L	--	(j)	27.0	12.0 J	NA	NA	<10.0	13,000	900	17.1
Lead	ug/L	5.4	(d) (e)	<0.200	<0.200	NA	NA	<0.200	13.8	1.80 J	NA
Magnesium	ug/L	--	(j)	<130	<130	NA	NA	<130	15,300	7,500	3,640
Manganese	ug/L	120	(i)	0.800 J	0.590 J	<3.00	0.600	<0.500	82.6	8.40	NA
Mercury	ug/L	0.77	(d) (e)	<0.150	<0.150	NA	NA	<0.150	0.150	<0.150	NA
Nickel	ug/L	31.24	(a)	5.40	5.60	NA	1.00	<0.500	11.1	3.10	27.0
Potassium	ug/L	--	(j)	51,700	54,800	NA	6,360	4,500	5,670	2,800	1,180
Selenium	ug/L	5	(d)	3.90	4.20	NA	NA	0.800 J	NA	0.650 J	NA
Silver	ug/L	0.12	(c)	<0.500	<0.500	NA	NA	<0.500	NA	<0.500	2.20
Sodium	ug/L	--	(j)	221,000	219,000	NA	17,600	15,800	19,000	8,900	5,310
Thallium	ug/L	10	(c)	0.240 J	0.700 J	NA	NA	<0.200	3.80	<0.200	NA
Vanadium	ug/L	12	(c)	5.60 B	5.80	NA	6.40	12.0	5.20	<1.80 B	NA
Zinc	ug/L	71.69	(a)	<10.0	<10.0	NA	9.20	<10.0	85.9	<10.0	8.90
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	55.0 J	61.0 J	NA	956	1,000	NA	160	39.8
Antimony	ug/L	80	(c)	<2.50	<2.50	NA	NA	0.550 J	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	12.0	14.0	NA	NA	1.10 J	NA	<0.500	NA
Barium	ug/L	220	(c)	16.0	18.0	NA	32.4	22.0	13.7	14.0	4.20
Beryllium	ug/L	3.6	(c)	<2.50	<2.50	NA	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<2.00	<2.00	NA	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	49,100	55,600	NA	59,900	59,800	18,600	19,900	9,440
Chromium	ug/L	42	(c)	<2.50	<2.50	NA	60.0	43.0	NA	<0.500	NA
Cobalt	ug/L	24	(c)	<2.50	<2.50	NA	NA	<0.500	NA	<0.500	NA
Copper	ug/L	5.56	(a)	<2.50	<2.50	NA	1.80	1.50 J	NA	<0.500	NA
Iron	ug/L	--	(j)	<50.0	<50.0	NA	NA	<10.0	NA	68.0	NA
Lead	ug/L	5.4	(d) (e)	<1.00	<1.00	NA	NA	<0.200	2.60	<0.200	NA
Magnesium	ug/L	--	(j)	<630	<630	NA	NA	<130	5,850	6,300	3,800
Manganese	ug/L	120	(i)	<2.50	<2.50	NA	NA	0.520 J	3.50	0.900 J	NA

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Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-3DS	RW-3DS	RW-3DS	RW-4	RW-4	RW-4	RW-4	RW-4A
Sample Depth():				155 - 160	155 - 160	155 - 160	333 - 343	333 - 343	393 - 403	393 - 403	62 - 72
Date Collected:				42241.00	42241.00	42355.00	41891.00	42240.00	41892.00	42226.00	41892.00
Sample Name:	Units	Chronic	Note	DUP-04-082515	RW-3DS-(155-160)-082515	RW-3DS-121715	RW-4(333-343)(090914)	RW-4-(333-343)-082415	RW-4(393-403)(091014)	RW-4-(393-403)-081015	RW-4A(62-72)(091014)
Mercury	ug/L	0.77	(d) (e)	<0.150	<0.150	NA	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	3.50 J	3.70 J	NA	1.10	<0.500	3.10	0.560 J	18.8
Potassium	ug/L	--	(j)	52,400	56,000	NA	7,190	5,400	4,200	2,100	1,200
Selenium	ug/L	5	(d)	4.10 J	3.10 J	NA	NA	<0.600	NA	<0.600	NA
Silver	ug/L	0.12	(c)	<2.50	<2.50	NA	NA	<0.500	NA	<0.500	2.80
Sodium	ug/L	--	(j)	209,000	220,000	NA	18,900	18,800	14,100	8,000	5,550
Thallium	ug/L	10	(c)	<1.00	1.20 J	NA	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	<8.30 B	<8.50 B	NA	6.70	13.0	NA	<1.20 B	NA
Zinc	ug/L	71.69	(a)	<50.0	<50.0	NA	NA	<10.0	17.8	<10.0	18.5
Miscellaneous											
Alkalinity	ug/L	--		104,000	92,100	94,100	236,000	128,000	53,800	64,600	46,100
Alkalinity, Bicarbonate	ug/L	--		<5,000	<5,000	NA	NA	<5,000	NA	64,600	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	<81	NA	NA	NA	NA	NA
Chloride	ug/L	--		31,400	32,200	36,200	6,700	3,760	NA	1,410	2,100
Cyanide	ug/L	--		<7	<7	NA	NA	<7	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	<15	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	28	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	80 J	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	80 J	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	<29	NA	NA	NA	NA	NA
Sulfate	ug/L	--		467,000	464,000	425,000	20,300	21,200	20,900	15,500	10,400
Sulfide	ug/L	--		NA	NA	4,000	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	410	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	6,600	NA	NA	NA	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-4A 62 - 72 42226.00 RW-4A-(62-72)-081015	RW-4A 113 - 123 41892.00 RW-4A(113-123)(091014)	RW-4A 113 - 123 42240.00 RW-4A-(113-123)-082415	RW-5 - - 41886.00 RW-5(090414)	RW-5 - - 42221.00 RW-5-080515	RW-5 - - 42353.00 RW-5-121515	RW-5A - - 41892.00 RW-5A(091014)	RW-5A - - 42240.00 RW-5A-082415
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	<0.43	NA	<0.43	NA	NA	<0.43
Aroclor-1221	ug/L	--		<0.34	NA	<0.34	NA	<0.34	NA	NA	<0.34
Aroclor-1232	ug/L	--		<0.4	NA	<0.4	NA	<0.4	NA	NA	<0.4
Aroclor-1242	ug/L	--		<0.22	NA	<0.22	NA	<0.22	NA	NA	<0.22
Aroclor-1248	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	NA	<0.15
Aroclor-1254	ug/L	--		<0.17	NA	1.3	NA	<0.17	NA	NA	0.18 J
Aroclor-1260	ug/L	--		<0.18	NA	<0.18	NA	<0.18	NA	NA	<0.18
Total PCBs	ug/L	--		<0.43	NA	1.3	NA	<0.5	NA	NA	<0.43
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	NA	<0.19	NA	<0.19	<0.28	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	<0.19	NA	<0.19	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	NA	<0.15	NA	<0.15	<0.34	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	NA	<0.19	NA	<0.19	<0.08	NA	<0.19
1,1-Dichloroethane	ug/L	--		<0.24	NA	<0.24	NA	<0.24	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.25	NA	<0.25	NA	<0.25	<0.34	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		<0.55	NA	<2.1	NA	<2.1	NA	NA	<1.8
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	<0.007	NA	<0.01
1,2-Dibromoethane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	<0.006	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	<0.22	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.2	NA	<0.2	NA	<0.2	<0.25	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.25	NA	<0.25	NA	<0.25	<0.18	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	NA	<0.18	NA	<0.18	<0.33	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	NA	<0.17	NA	<0.17	<0.33	NA	<0.17
2-Butanone	ug/L	--		<2.6	NA	<2.6	NA	<2.6	<2.2	NA	<2.6
2-Hexanone	ug/L	--		<1.3	NA	<1.3	NA	<1.3	<0.72	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		<0.81	NA	<0.81	NA	<0.81	<0.63	NA	<0.81
Acetone	ug/L	--		<2.7	NA	<2.7	NA	<4.9 B	<1.1	NA	<2.7
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	<0.3	NA	NA
Bromodichloromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	<0.15	NA	<0.17
Bromoform	ug/L	230	(c)	<0.29	NA	<0.29	NA	<0.29	<0.18	NA	<0.29
Bromomethane	ug/L	16	(c)	<0.35 J	NA	<0.35	NA	<0.35	<0.18	NA	<0.35
Carbon Disulfide	ug/L	--		<0.22	NA	<0.22	NA	<0.22	<0.22	NA	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.18	NA	<0.18	NA	<0.18	<0.33	NA	<0.18
Chlorobenzene	ug/L	47	(c)	<0.18	NA	<0.18	NA	<0.18	<0.24	NA	<0.18
Chloroethane	ug/L	--		<0.36	NA	<0.36	1.7	1.4	1.9	NA	<0.36
Chloroform	ug/L	140	(c)	<0.23	NA	<0.23	NA	<0.23	<0.22	NA	<0.23
Chloromethane	ug/L	--		<0.36	NA	<0.36 J	NA	<0.36	<0.22	NA	<0.36 J
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	NA	<0.21	NA	<0.21	<0.26	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	<0.16	NA	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	NA	<0.25	NA	<0.25	<0.22	NA	<0.25

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-4A	RW-4A	RW-4A	RW-5	RW-5	RW-5	RW-5A	RW-5A
Sample Depth():				62 - 72	113 - 123	113 - 123	- -	- -	- -	- -	- -
Date Collected:				42226.00	41892.00	42240.00	41886.00	42221.00	42353.00	41892.00	42240.00
Sample Name:	Units	Chronic	Note	RW-4A-(62-72)-081015	RW-4A(113-123)(091014)	RW-4A-(113-123)-082415	RW-5(090414)	RW-5-080515	RW-5-121515	RW-5A(091014)	RW-5A-082415
Dichlorodifluoromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	<0.14	NA	<0.17
Isopropylbenzene	ug/L	--		<0.33	NA	<0.33	NA	<0.33	<0.32	NA	<0.33
Methyl acetate	ug/L	--		<0.58	NA	<0.58 J	NA	<0.58	<0.58	NA	<0.58 J
Methylcyclohexane	ug/L	--		<0.09	NA	<0.09	NA	<0.09	<0.22	NA	<0.09
Methylene Chloride	ug/L	940	(c)	<0.22	NA	<0.22	NA	<0.22	<0.21	NA	<0.22
Styrene	ug/L	32	(c)	<0.28	NA	<0.28	NA	<0.28	<0.17	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.14	NA	<0.14	NA	<0.14	<0.12	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	NA	<0.23	NA	<0.23	<0.18	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	<0.19	NA	<0.17
Trichloroethene	ug/L	47	(c)	<0.2	NA	<0.2	NA	<0.2	<0.22	NA	<0.2
Trichlorofluoromethane	ug/L	--		<0.21	NA	<0.21	NA	<0.21	<0.15 J	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.18	NA	<0.18	NA	<0.18	<0.06	NA	<0.18
Benzene	ug/L	114	(c)	<0.2	NA	<0.2	NA	<0.2	0.13 J	NA	0.22 J
Toluene	ug/L	253	(c)	<0.17	NA	<0.17	NA	<0.17	<0.25	NA	<0.17
Ethylbenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	<0.3	NA	<0.19
Xylenes (total)	ug/L	27	(c)	<0.58	NA	<0.58	NA	<0.58	<0.28	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	NA	<0.17	NA	<0.17	<0.13	NA	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	<0.35 J	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	NA	<0.2	NA	<0.2	<0.27	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	<0.27	NA	<0.27	NA	6.7 J	3.28	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<0.73	NA	<2.8 J	NA	<2.8	NA	NA	<2.4 J
2,3,4,6-Tetrachlorophenol	ug/L	--		<1.8	NA	<6.9	NA	<6.9	NA	NA	<5.9
2,4,5-Trichlorophenol	ug/L	--		<1.8	NA	<7.1	NA	<7.1	NA	NA	<6.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<1.8	NA	<6.8	NA	<6.8	NA	NA	<5.9
2,4-Dichlorophenol	ug/L	11	(c)	<1.5	NA	<5.6	NA	<5.6	NA	NA	<4.8
2,4-Dimethylphenol	ug/L	100	(c)	<1.1	NA	<4.2	NA	<4.2	NA	NA	<3.6
2,4-Dinitrophenol	ug/L	19	(c)	<1.5	NA	<5.9	NA	<5.9	NA	NA	<5.1
2,4-Dinitrotoluene	ug/L	44	(c)	<0.83	NA	<3.2	NA	<3.2	NA	NA	<2.8
2,6-Dinitrotoluene	ug/L	--		<0.6	NA	<2.3	NA	<2.3	NA	NA	<2
2-Chloronaphthalene	ug/L	0.396	(c)	<0.73	NA	<2.8	NA	<2.8	NA	NA	<2.4
2-Chlorophenol	ug/L	24	(c)	<1.3	NA	<4.8	NA	<4.8	NA	NA	<4.1
2-Methylnaphthalene	ug/L	330	(c)	<0.1	NA	<0.4	NA	<0.4	NA	NA	<0.34
2-Methylphenol	ug/L	--		<0.6	NA	<2.3	NA	<2.3	NA	NA	<2
2-Nitroaniline	ug/L	--		<0.96	NA	<3.7	NA	<3.7	NA	NA	<3.2
2-Nitrophenol	ug/L	--		<1.4	NA	<5.3	NA	<5.3	NA	NA	<4.6
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<0.86	NA	<3.3	NA	<3.3	NA	NA	<2.8
3-Methylphenol, 4-Methylphenol	ug/L	--		<0.57	NA	<2.2	NA	<2.2	NA	NA	<1.9
3-Nitroaniline	ug/L	--		<0.7	NA	<2.7	NA	<2.7	NA	NA	<2.3
4,6-Dinitro-2-methylphenol	ug/L	--		<2.4	NA	<9.3	NA	<9.3	NA	NA	<8
4-Bromophenyl-phenylether	ug/L	--		<0.7	NA	<2.7	NA	<2.7	NA	NA	<2.3
4-Chloro-3-Methylphenol	ug/L	--		<1.2	NA	<4.5	NA	<4.5	NA	NA	<3.9

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-4A	RW-4A	RW-4A	RW-5	RW-5	RW-5	RW-5A	RW-5A
Sample Depth():				62 - 72	113 - 123	113 - 123	- -	- -	- -	- -	- -
Date Collected:				42226.00	41892.00	42240.00	41886.00	42221.00	42353.00	41892.00	42240.00
Sample Name:	Units	Chronic	Note	RW-4A-(62-72)-081015	RW-4A(113-123)(091014)	RW-4A-(113-123)-082415	RW-5(090414)	RW-5-080515	RW-5-121515	RW-5A(091014)	RW-5A-082415
4-Chloroaniline	ug/L	--		<1.1	NA	<4.2	NA	<4.2	NA	NA	<3.6
4-Chlorophenyl-phenylether	ug/L	--		<0.73	NA	<2.8	NA	<2.8	NA	NA	<2.4
4-Nitroaniline	ug/L	--		<0.81	NA	<3.1	NA	<3.1	NA	NA	<2.7
4-Nitrophenol	ug/L	60	(c)	<1.4	NA	<5.4	NA	<5.4	NA	NA	<4.7
Acenaphthene	ug/L	38	(c)	<0.083	NA	<0.32	NA	<0.32	NA	NA	<0.28
Acenaphthylene	ug/L	4840	(c)	<0.091	NA	<0.35	NA	<0.35	NA	NA	<0.3
Acetophenone	ug/L	--		<0.6	NA	<2.3	0.51	<2.3	NA	NA	<2
Anthracene	ug/L	0.035	(c)	<0.099	NA	<0.38	NA	<0.38	NA	NA	<0.33
Atrazine	ug/L	--		<0.76	NA	<2.9	NA	<2.9	NA	NA	<2.5
Benzaldehyde	ug/L	--		<1.5	NA	<5.7	NA	<5.7	NA	NA	<4.9
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	<0.023	NA	<0.025	NA	NA	<0.022
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	<0.023	NA	<0.025	NA	NA	<0.022
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	<0.023	NA	<0.025	NA	NA	<0.022
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.16	NA	<0.62	NA	<0.62	NA	NA	<0.53
Benzo(k)fluoranthene	ug/L	--		<0.096	NA	<0.37	NA	<0.37	NA	NA	<0.32
bis(2-Chloroethoxy)methane	ug/L	--		<0.81	NA	<3.1	NA	<3.1	NA	NA	<2.7
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<0.73	NA	<2.8	NA	<2.8	NA	NA	<2.4
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<1.6	NA	<6	3.6	<6	NA	2.4	<5.2
Butylbenzylphthalate	ug/L	23	(c)	<0.65	NA	<2.5	NA	<2.5	NA	NA	<2.2
Caprolactam	ug/L	--		<0.63	NA	<2.4	NA	<2.4	NA	1.2	<2.1
Carbazole	ug/L	--		<0.73	NA	<2.8	NA	<2.8	NA	NA	<2.4
Chrysene	ug/L	--		<0.086	NA	<0.33	NA	<0.33	NA	NA	<0.28
Cyclohexane	ug/L	--		<0.13	NA	<0.13	NA	<0.13	<0.26	NA	<0.13
Dibenzo(a,h)anthracene	ug/L	--		<0.12	NA	<0.45	NA	<0.45	NA	NA	<0.39
Dibenzofuran	ug/L	--		<0.76	NA	<2.9	NA	<2.9	NA	NA	<2.5
Diethylphthalate	ug/L	110	(c)	<0.78	NA	<3	NA	<3	NA	NA	<2.6
Dimethylphthalate	ug/L	--		<0.81	NA	<3.1	NA	<3.1	NA	NA	<2.7
Di-n-Butylphthalate	ug/L	9.7	(c)	<0.65	1.5	<2.5	NA	<2.5	NA	NA	<2.2
Di-n-Octylphthalate	ug/L	--		<0.65	NA	<2.5	NA	<2.5	NA	NA	<2.2
Diphenyl ether	ug/L	--		<0.57	NA	<2.2	NA	<2.2	NA	NA	<1.9
Fluoranthene	ug/L	1.9	(c)	<0.083	NA	<0.32	NA	<0.32	NA	NA	<0.28
Fluorene	ug/L	19	(c)	<0.083	NA	<0.32	NA	<0.32	NA	NA	<0.28
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	<0.013	NA	<0.014	NA	NA	<0.013
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	<0.19	NA	<0.2	NA	NA	<0.18
Hexachlorocyclopentadiene	ug/L	77	(c)	<0.47	NA	<1.8	NA	<1.8	NA	NA	<1.6
Hexachloroethane	ug/L	8	(c)	<0.49	NA	<1.9	NA	<1.9	NA	NA	<1.6
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.11	NA	<0.41	NA	<0.41	NA	NA	<0.35
Isophorone	ug/L	920	(c)	<0.81	NA	<3.1	NA	<3.1	NA	NA	<2.7
Naphthalene	ug/L	13	(c)	<0.096	NA	<0.37	NA	<0.37	NA	NA	<0.32
Nitrobenzene	ug/L	220	(c)	<0.7	NA	<2.7	NA	<2.7	NA	NA	<2.3
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	<0.19	NA	<0.2	NA	NA	<0.18
N-Nitroso-di-n-propylamine	ug/L	--		<0.89	NA	<3.4	NA	<3.4	NA	NA	<2.9
N-Nitrosodiphenylamine	ug/L	--		<0.94	NA	<3.6	NA	<3.6	NA	NA	<3.1

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-4A	RW-4A	RW-4A	RW-5	RW-5	RW-5	RW-5A	RW-5A
Sample Depth():				62 - 72	113 - 123	113 - 123	- -	- -	- -	- -	- -
Date Collected:				42226.00	41892.00	42240.00	41886.00	42221.00	42353.00	41892.00	42240.00
Sample Name:	Units	Chronic	Note	RW-4A-(62-72)-081015	RW-4A(113-123)(091014)	RW-4A-(113-123)-082415	RW-5(090414)	RW-5-080515	RW-5-121515	RW-5A(091014)	RW-5A-082415
Pentachlorophenol	ug/L	--		<0.1	NA	<0.093	NA	R	NA	NA	<0.089
Phenanthrene	ug/L	3.6	(c)	<0.11	NA	<0.42	0.145	<0.42	NA	NA	<0.36
Phenol	ug/L	180	(c)	<0.39	NA	<1.5	NA	<1.5	NA	NA	<1.3
Pyrene	ug/L	0.3	(c)	<0.091	NA	<0.35	NA	<0.35	NA	NA	<0.3
Inorganics											
Aluminum	ug/L	87	(i)	86.0	79.3	16.0 J	318	400	NA	253	55.0
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	NA	<0.500
Arsenic	ug/L	150	(d) (e)	<0.500	NA	<0.500	9.40	8.90	NA	7.60	3.30
Barium	ug/L	220	(c)	4.10	16.4	14.0	9.80	9.40	NA	46.6	25.0
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	9,800	12,800	12,900	15,700	17,700	NA	100,000	76,300
Chromium	ug/L	42	(c)	0.610 J	NA	<0.500	5.20	3.70	NA	1.50	<0.500
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	NA	<0.500	NA	2.30	1.20 J
Copper	ug/L	5.56	(a)	0.810 J	4.60	<0.500	6.10	8.90	NA	2.30	0.500 J
Iron	ug/L	--	(j)	140	23.3	28.0	3,090	2,300	NA	9,950	4,300
Lead	ug/L	5.4	(d) (e)	0.440 J	NA	<0.200	4.70	6.60	NA	2.20	<0.200
Magnesium	ug/L	--	(j)	4,000	4,720	4,700	3,280	3,200	NA	10,900	8,400
Manganese	ug/L	120	(i)	2.10	2.70	1.60 J	288	290	351	1,650	1,000
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	27.0	68.7	15.0	2.20	3.60	NA	3.00	0.850 J
Potassium	ug/L	--	(j)	1,200	1,460	1,400	71,200	58,600	NA	18,600	10,900
Selenium	ug/L	5	(d)	<0.600	NA	<0.600	NA	<0.600	NA	NA	<0.600
Silver	ug/L	0.12	(c)	<0.500	2.50	<0.500	1.30	<0.500	NA	NA	<0.500
Sodium	ug/L	--	(j)	5,700	5,860	5,700	50,700	44,000	NA	11,300	7,700
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	<1.70 B	NA	<1.90 B	3.40	4.90 B	NA	1.60	2.20 B
Zinc	ug/L	71.69	(a)	<10.0	8.50	<10.0	206	220	NA	78.7	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	16.0 J	34.3	<9.60	50.0	160	NA	NA	<9.60
Antimony	ug/L	80	(c)	<0.500	NA	0.630 J	NA	0.690 J	NA	NA	<0.500
Arsenic	ug/L	150	(d) (e)	<0.500	NA	<0.500	7.90	7.20	NA	4.70	1.10 J
Barium	ug/L	220	(c)	4.10	16.0	15.0	4.10	5.50	NA	49.6	25.0
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	9,900	12,900	13,400	10,600	13,600	NA	115,000	69,700
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	1.10	1.40 J	NA	0.900	<0.500
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	NA	<0.500	NA	2.60	1.10 J
Copper	ug/L	5.56	(a)	<0.500	NA	<0.500	NA	4.50	NA	NA	<0.500
Iron	ug/L	--	(j)	19.0 J	NA	<10.0	125	730	NA	6,720	140
Lead	ug/L	5.4	(d) (e)	<0.200	NA	<0.200	1.40	2.40	NA	1.80	<0.200
Magnesium	ug/L	--	(j)	4,200	4,620	5,100	1,730	2,600	NA	12,400	8,300
Manganese	ug/L	120	(i)	0.860 J	1.00	1.30 J	27.4	110	NA	1,850	1,000 B

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Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-4A 62 - 72 42226.00 RW-4A-(62-72)-081015	RW-4A 113 - 123 41892.00 RW-4A(113-123)(091014)	RW-4A 113 - 123 42240.00 RW-4A-(113-123)-082415	RW-5 - - 41886.00 RW-5(090414)	RW-5 - - 42221.00 RW-5-080515	RW-5 - - 42353.00 RW-5-121515	RW-5A - - 41892.00 RW-5A(091014)	RW-5A - - 42240.00 RW-5A-082415
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	28.0	41.6	17.0	NA	3.40	NA	2.50	1.20 J
Potassium	ug/L	--	(j)	1,300	1,470	1,500	72,500	53,500	NA	20,700	10,300
Selenium	ug/L	5	(d)	<0.600	NA	<0.600	NA	<0.600	NA	NA	<0.600
Silver	ug/L	0.12	(c)	<0.500	1.80	<0.500	NA	<0.500	NA	NA	<0.500
Sodium	ug/L	--	(j)	5,900	5,890	6,400	51,900	40,600	NA	12,300	7,300
Thallium	ug/L	10	(c)	<0.200	NA	0.370 J	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	<1.40 B	NA	2.50 B	1.80	3.40 B	NA	1.20	<0.870 B
Zinc	ug/L	71.69	(a)	<10.0	12.5	<10.0	8.40	69.0	NA	12.6	<10.0
Miscellaneous											
Alkalinity	ug/L	--		36,100	44,900	44,400	233,000	178,000	164,000	359,000	221,000
Alkalinity, Bicarbonate	ug/L	--		36,100	NA	44,400	NA	46,100	NA	NA	221,000
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	380 J	NA	NA
Chloride	ug/L	--		1,310	NA	1,540	2,000	1,540	1,900	NA	1,530
Cyanide	ug/L	--		<7	NA	16	NA	<7	NA	NA	<7
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	110	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	130	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	<21	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	<21	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	<29	NA	NA
Sulfate	ug/L	--		9,970	14,800	14,700	18,600	16,000	16,000	12,700	9,230
Sulfide	ug/L	--		NA	NA	NA	NA	NA	<820	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	320	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	3,200	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-5A / -- / 42353.00 / RW-5A-121515	RW-6 / -- / 41887.00 / RW-6(090514)	RW-6 / -- / 41921.00 / RW-6(100914)	RW-6 / -- / 42116.00 / RW-6-042215	RW-6 / -- / 42221.00 / RW-6-080515	RW-6 / -- / 42352.00 / RW-6-121415	RW-6A / -- / 41887.00 / RW-6A(090514)	RW-6A / -- / 41921.00 / RW-6A(100914)
PCBs											
Aroclor-1016	ug/L	--		NA	NA	NA	NA	<0.43	NA	NA	NA
Aroclor-1221	ug/L	--		NA	NA	NA	NA	<0.34	NA	NA	NA
Aroclor-1232	ug/L	--		NA	NA	NA	NA	<0.4	NA	NA	NA
Aroclor-1242	ug/L	--		NA	NA	NA	NA	<0.22	NA	NA	NA
Aroclor-1248	ug/L	--		NA	NA	NA	NA	<0.15	NA	NA	NA
Aroclor-1254	ug/L	--		NA	NA	NA	NA	<0.17	NA	NA	NA
Aroclor-1260	ug/L	--		NA	NA	NA	NA	<0.18	NA	NA	NA
Total PCBs	ug/L	--		NA	NA	NA	NA	<0.5	NA	NA	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.28	NA	NA	<0.25	<0.19	<0.28	NA	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	NA	<0.21	<0.19	<0.19	NA	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.34	NA	NA	<0.52	<0.15	<0.34	NA	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.08	NA	NA	<0.21	<0.19	<0.08	NA	NA
1,1-Dichloroethane	ug/L	--		<0.24	0.72	0.47	0.5 J	0.62 J	0.58 J	0.37	NA
1,1-Dichloroethene	ug/L	65	(c)	<0.34	NA	NA	<0.51	<0.25	<0.34	NA	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	NA	NA	<2.1	NA	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.007	NA	NA	<0.99	<0.01	<0.007	NA	NA
1,2-Dibromoethane	ug/L	--		<0.006	NA	NA	<0.23	<0.01	<0.006	NA	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.22	NA	NA	<0.19	<0.19	<0.22	NA	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.25	NA	NA	<0.18	<0.2	<0.25	NA	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.18	NA	NA	<0.39	<0.25	<0.18	NA	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.33	NA	NA	<0.23	<0.18	<0.33	NA	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.33	NA	NA	<0.27	<0.17	<0.33	0.25	NA
2-Butanone	ug/L	--		<2.2	NA	NA	<5.6	<2.6	<2.2	NA	NA
2-Hexanone	ug/L	--		<0.72	NA	NA	<1.7	<1.3	<0.72	NA	NA
4-Methyl-2-pentanone	ug/L	--		<0.63	NA	NA	<1	<0.81	<0.63	NA	NA
Acetone	ug/L	--		<1.1	NA	NA	<3.3	<2.7	<1.1	NA	NA
Bromochloromethane	ug/L	--		<0.3	NA	NA	NA	NA	<0.3	NA	NA
Bromodichloromethane	ug/L	--		<0.15	NA	NA	<0.23	<0.17	<0.15	NA	NA
Bromoform	ug/L	230	(c)	<0.18	NA	NA	<0.23	<0.29	<0.18	NA	NA
Bromomethane	ug/L	16	(c)	<0.18	NA	NA	<0.42	<0.35	<0.18	NA	NA
Carbon Disulfide	ug/L	--		<0.22	NA	NA	<0.25	<0.22	<0.22	NA	NA
Carbon Tetrachloride	ug/L	240	(c)	<0.33	NA	NA	<0.22	<0.18	<0.33	NA	NA
Chlorobenzene	ug/L	47	(c)	<0.24	NA	NA	<0.19	<0.18	<0.24	NA	NA
Chloroethane	ug/L	--		<0.37	3.5	1.3	1.7	3.3	5.3	1.1	1.5
Chloroform	ug/L	140	(c)	<0.22	NA	NA	<0.19	<0.23	<0.22	NA	NA
Chloromethane	ug/L	--		<0.22	NA	NA	<0.41	<0.36	<0.22	NA	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.26	NA	NA	<0.27	<0.21	<0.26	NA	NA
cis-1,3-Dichloropropene	ug/L	--		<0.16	NA	NA	<0.21	<0.17	<0.16	NA	NA
Cyclohexane	ug/L	--		NA	0.7	NA	NA	NA	NA	2.2	3.1
Dibromochloromethane	ug/L	--		<0.22	NA	NA	<0.15	<0.25	<0.22	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-5A / -- / 42353.00 / RW-5A-121515	RW-6 / -- / 41887.00 / RW-6(090514)	RW-6 / -- / 41921.00 / RW-6(100914)	RW-6 / -- / 42116.00 / RW-6-042215	RW-6 / -- / 42221.00 / RW-6-080515	RW-6 / -- / 42352.00 / RW-6-121415	RW-6A / -- / 41887.00 / RW-6A(090514)	RW-6A / -- / 41921.00 / RW-6A(100914)
Dichlorodifluoromethane	ug/L	--		<0.14	NA	NA	<0.9	<0.17	<0.14	NA	NA
Isopropylbenzene	ug/L	--		<0.32	0.57	NA	<0.23	<0.33	<0.32	4.4	5.9
Methyl acetate	ug/L	--		<0.58	NA	NA	<1.9	<0.58	<0.58	NA	NA
Methylcyclohexane	ug/L	--		<0.22	1	NA	<0.22	0.33 J	0.49 J	0.64	0.84
Methylene Chloride	ug/L	940	(c)	<0.21	NA	NA	<0.73	<0.22	<0.21	NA	NA
Styrene	ug/L	32	(c)	<0.17	NA	NA	<0.27	<0.28	<0.17	NA	NA
Tetrachloroethene	ug/L	45	(c)	<0.12	NA	NA	<0.4	<0.14	<0.12	NA	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.18	NA	NA	<0.65	<0.23	<0.18	NA	NA
trans-1,3-Dichloropropene	ug/L	--		<0.19	NA	NA	<0.19	<0.17	<0.19	NA	NA
Trichloroethene	ug/L	47	(c)	<0.22	NA	NA	<0.22	<0.2	<0.22	NA	NA
Trichlorofluoromethane	ug/L	--		<0.15 J	NA	NA	<0.43	<0.21	<0.15	NA	NA
Vinyl Chloride	ug/L	930	(c)	<0.06	NA	NA	<0.15	<0.18	<0.06	NA	NA
Benzene	ug/L	114	(c)	0.095 J	2.1	15.7	2.2	1.2	1.5	88.1	6.8
Toluene	ug/L	253	(c)	<0.25	NA	NA	<0.16	<0.17	<0.25	NA	NA
Ethylbenzene	ug/L	14	(c)	<0.3	NA	NA	<0.27	<0.19	<0.3	NA	0.99
Xylenes (total)	ug/L	27	(c)	<0.28	NA	NA	<0.17	<0.58	<0.28	16.1	54.3
Methyl tert-butyl ether	ug/L	51000	(f)	<0.13	NA	NA	<0.24	<0.17	<0.13	NA	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		<0.35 J	NA	NA	NA	NA	<0.35	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	NA	NA	<0.01	NA	NA	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.27	NA	NA	<0.21	<0.2	<0.27	NA	NA
1,4-Dioxane	ug/L	22000	(k)	<0.053	NA	NA	NA	1.5 J	1.09	NA	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	NA	NA	<6.9	NA	NA	NA
2,4,5-Trichlorophenol	ug/L	--		NA	NA	NA	NA	<7.1	NA	NA	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	NA	NA	<6.8	NA	NA	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	NA	NA	<5.6	NA	NA	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	NA	NA	<4.2	NA	NA	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	NA	NA	<5.9	NA	NA	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	NA	NA	<3.2	NA	NA	NA
2,6-Dinitrotoluene	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	NA	NA	<2.8	NA	NA	NA
2-Chlorophenol	ug/L	24	(c)	NA	NA	NA	NA	<4.8	NA	NA	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	NA	NA	<0.4	NA	0.46	0.88
2-Methylphenol	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	NA
2-Nitroaniline	ug/L	--		NA	NA	NA	NA	<3.7	NA	NA	NA
2-Nitrophenol	ug/L	--		NA	NA	NA	NA	<5.3	NA	NA	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	NA	NA	<3.3	NA	NA	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	NA	NA	<2.2	NA	NA	NA
3-Nitroaniline	ug/L	--		NA	NA	NA	NA	<2.7	NA	NA	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	NA	NA	<9.3	NA	NA	NA
4-Bromophenyl-phenylether	ug/L	--		NA	NA	NA	NA	<2.7	NA	NA	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	NA	NA	<4.5	NA	NA	NA

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-5A - - 42353.00 RW-5A-121515	RW-6 - - 41887.00 RW-6(090514)	RW-6 - - 41921.00 RW-6(100914)	RW-6 - - 42116.00 RW-6-042215	RW-6 - - 42221.00 RW-6-080515	RW-6 - - 42352.00 RW-6-121415	RW-6A - - 41887.00 RW-6A(090514)	RW-6A - - 41921.00 RW-6A(100914)
4-Chloroaniline	ug/L	--		NA	NA	NA	NA	<4.2	NA	NA	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	NA
4-Nitroaniline	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	NA
4-Nitrophenol	ug/L	60	(c)	NA	NA	NA	NA	<5.4	NA	NA	NA
Acenaphthene	ug/L	38	(c)	NA	0.107	NA	NA	<0.32	NA	NA	NA
Acenaphthylene	ug/L	4840	(c)	NA	NA	NA	NA	<0.35	NA	NA	NA
Acetophenone	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	NA
Anthracene	ug/L	0.035	(c)	NA	NA	NA	NA	<0.38	NA	NA	NA
Atrazine	ug/L	--		NA	NA	NA	NA	<2.9	NA	NA	NA
Benzaldehyde	ug/L	--		NA	NA	NA	NA	<5.7	NA	NA	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	NA	NA	<0.025	NA	NA	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	NA	NA	<0.025	NA	NA	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	NA	NA	<0.025	NA	NA	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	NA	NA	<0.62	NA	NA	NA
Benzo(k)fluoranthene	ug/L	--		NA	NA	NA	NA	<0.37	NA	NA	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	NA	NA	<2.8	NA	NA	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	1.6	1.2	NA	<6	NA	NA	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	NA	NA	<2.5	NA	NA	NA
Caprolactam	ug/L	--		NA	NA	NA	NA	<2.4	NA	NA	NA
Carbazole	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	NA
Chrysene	ug/L	--		NA	NA	NA	NA	<0.33	NA	NA	NA
Cyclohexane	ug/L	--		<0.26	NA	NA	<0.28	0.48 J	0.69 J	NA	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	NA	NA	<0.45	NA	NA	NA
Dibenzofuran	ug/L	--		NA	NA	NA	NA	<2.9	NA	NA	NA
Diethylphthalate	ug/L	110	(c)	NA	NA	NA	NA	<3	NA	NA	NA
Dimethylphthalate	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	NA	NA	NA	<2.5	NA	NA	NA
Di-n-Octylphthalate	ug/L	--		NA	NA	NA	NA	<2.5	NA	NA	NA
Diphenyl ether	ug/L	--		NA	NA	NA	NA	<2.2	NA	NA	NA
Fluoranthene	ug/L	1.9	(c)	NA	NA	NA	NA	<0.32	NA	NA	NA
Fluorene	ug/L	19	(c)	NA	NA	NA	NA	<0.32	NA	NA	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	NA	NA	<0.014	NA	NA	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	NA	NA	<0.2	NA	NA	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	NA	NA	<1.8	NA	NA	NA
Hexachloroethane	ug/L	8	(c)	NA	NA	NA	NA	<1.9	NA	NA	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	NA	NA	<0.41	NA	NA	NA
Isophorone	ug/L	920	(c)	NA	NA	NA	NA	<3.1	NA	NA	NA
Naphthalene	ug/L	13	(c)	NA	0.547	0.43	NA	<0.37	NA	2.96	NA
Nitrobenzene	ug/L	220	(c)	NA	NA	NA	NA	<2.7	NA	NA	NA
N-Nitrosodimethylamine	ug/L	--		NA	NA	NA	NA	<0.2	NA	NA	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	NA	NA	<3.4	NA	NA	NA
N-Nitrosodiphenylamine	ug/L	--		NA	NA	NA	NA	<3.6	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-5A - - 42353.00 RW-5A-121515	RW-6 - - 41887.00 RW-6(090514)	RW-6 - - 41921.00 RW-6(100914)	RW-6 - - 42116.00 RW-6-042215	RW-6 - - 42221.00 RW-6-080515	RW-6 - - 42352.00 RW-6-121415	RW-6A - - 41887.00 RW-6A(090514)	RW-6A - - 41921.00 RW-6A(100914)
Pentachlorophenol	ug/L	--		NA	NA	NA	NA	R	NA	NA	NA
Phenanthrene	ug/L	3.6	(c)	NA	NA	NA	NA	<0.42	NA	NA	NA
Phenol	ug/L	180	(c)	NA	NA	NA	NA	<1.5	NA	NA	NA
Pyrene	ug/L	0.3	(c)	NA	NA	NA	NA	<0.35	NA	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	92.2	67.3	NA	12.0 J	NA	64.7	69.5
Antimony	ug/L	80	(c)	NA	NA	NA	NA	<0.500	NA	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	2.60	3.60	NA	<1.50 B	NA	NA	NA
Barium	ug/L	220	(c)	NA	422	449	NA	440	NA	33.5	43.5
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	<0.500	NA	NA	NA
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	<0.400	NA	NA	NA
Calcium	ug/L	--	(j)	NA	75,000	77,800	73,100	77,000	NA	70,300	76,700
Chromium	ug/L	42	(c)	NA	4.60	2.50	NA	2.90	NA	0.900	NA
Cobalt	ug/L	24	(c)	NA	6.00	5.10	NA	1.60 J	NA	13.3	17.2
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	<0.500	NA	1.50	5.60
Iron	ug/L	--	(j)	NA	41,800	44,000	40,400	36,300	NA	16,300	19,300
Lead	ug/L	5.4	(d) (e)	NA	1.30	NA	NA	0.250 J	NA	NA	NA
Magnesium	ug/L	--	(j)	NA	12,000	13,200	12,400	13,600	NA	16,200	17,300
Manganese	ug/L	120	(i)	778	6,970	6,940	NA	7,400	6,150	11,200	13,700
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	<0.150	NA	NA	NA
Nickel	ug/L	31.24	(a)	NA	1.80	NA	NA	1.10 J	NA	0.900	2.00
Potassium	ug/L	--	(j)	NA	3,010	3,540	NA	2,900	NA	2,650	2,960
Selenium	ug/L	5	(d)	NA	NA	NA	NA	<0.600	NA	NA	NA
Silver	ug/L	0.12	(c)	NA	2.90	NA	NA	<0.500	NA	3.60	2.50
Sodium	ug/L	--	(j)	NA	5,670	8,750	<10,000	6,800	NA	7,400	7,940
Thallium	ug/L	10	(c)	NA	NA	NA	NA	<0.200	NA	NA	NA
Vanadium	ug/L	12	(c)	NA	3.80	6.20	NA	2.70 B	NA	5.30	11.4
Zinc	ug/L	71.69	(a)	NA	33.6	NA	NA	<10.0	NA	NA	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	56.6	67.0	NA	<9.60	NA	55.2	58.5
Antimony	ug/L	80	(c)	NA	NA	NA	NA	<0.500	NA	NA	NA
Arsenic	ug/L	150	(d) (e)	NA	NA	3.30	NA	<1.10 B	NA	NA	NA
Barium	ug/L	220	(c)	NA	378	390	NA	380	NA	28.6	38.1
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	<0.500	NA	NA	NA
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	<0.400	NA	NA	NA
Calcium	ug/L	--	(j)	NA	73,900	76,800	70,900	75,400	NA	71,200	73,100
Chromium	ug/L	42	(c)	NA	1.00	NA	NA	0.870 J	NA	NA	NA
Cobalt	ug/L	24	(c)	NA	4.60	5.70	NA	1.40 J	NA	14.0	16.0
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	<0.500	NA	NA	NA
Iron	ug/L	--	(j)	NA	32,800	30,800	33,200	26,100	NA	11,700	15,900
Lead	ug/L	5.4	(d) (e)	NA	NA	NA	NA	<0.200	NA	NA	NA
Magnesium	ug/L	--	(j)	NA	12,200	13,200	12,000	13,700	NA	15,200	18,300
Manganese	ug/L	120	(i)	NA	7,210	6,760	NA	7,400	NA	11,000	13,700

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Appendix A
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Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-5A -- 42353.00 RW-5A-121515	RW-6 -- 41887.00 RW-6(090514)	RW-6 -- 41921.00 RW-6(100914)	RW-6 -- 42116.00 RW-6-042215	RW-6 -- 42221.00 RW-6-080515	RW-6 -- 42352.00 RW-6-121415	RW-6A -- 41887.00 RW-6A(090514)	RW-6A -- 41921.00 RW-6A(100914)
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	<0.150	NA	NA	NA
Nickel	ug/L	31.24	(a)	NA	NA	NA	NA	1.90 J	NA	1.00	2.30
Potassium	ug/L	--	(j)	NA	2,990	3,440	NA	2,900	NA	2,500	2,900
Selenium	ug/L	5	(d)	NA	NA	NA	NA	0.660 J	NA	NA	NA
Silver	ug/L	0.12	(c)	NA	3.20	NA	NA	<0.500	NA	3.20	2.50
Sodium	ug/L	--	(j)	NA	5,710	7,470	<10,000	6,500	NA	7,010	7,750
Thallium	ug/L	10	(c)	NA	NA	NA	NA	<0.200	NA	NA	NA
Vanadium	ug/L	12	(c)	NA	2.50	4.70	NA	<1.40 B	NA	4.00	8.90
Zinc	ug/L	71.69	(a)	NA	NA	10.2	NA	<10.0	NA	NA	NA
Miscellaneous											
Alkalinity	ug/L	--		210,000	298,000	274,000	NA	284,000	310,000	296,000	318,000
Alkalinity, Bicarbonate	ug/L	--		NA	NA	NA	253,000	284,000	NA	NA	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	254,000	NA	NA	NA	NA
Bromide	ug/L	--		<81	NA	NA	NA	NA	<81	NA	NA
Chloride	ug/L	--		1,420	3,200	3,800	11,200	5,970	<30	2,900	2,600
Cyanide	ug/L	--		NA	NA	NA	NA	7.2 J	NA	NA	NA
Fluoride, Total	ug/L	--		47 J	NA	NA	NA	NA	<15	NA	NA
Methane	ug/L	--		200	NA	NA	NA	NA	29,000	NA	NA
Nitrate and Nitrite	ug/L	--		<21	NA	NA	<100	NA	<21	NA	NA
Nitrate-N	ug/L	--		<21	NA	NA	NA	NA	<21	NA	NA
Nitrite	ug/L	--		<29	NA	NA	<10	NA	<29	NA	NA
Sulfate	ug/L	--		8,350	NA	NA	<10,000	1,410	740	NA	NA
Sulfide	ug/L	--		<820	NA	NA	NA	NA	<820	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	285,000	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		<140	NA	NA	NA	NA	490	NA	NA
Total Organic Carbon	ug/L	--		720 J	NA	NA	NA	NA	2,400	NA	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-6A	RW-6A	RW-6A	RW-7	RW-7	RW-7	RW-8	RW-8
Sample Depth():				- -	- -	- -	- -	- -	- -	163 - 173	163 - 173
Date Collected:				42115.00	42220.00	42352.00	41886.00	42114.00	42222.00	41904.00	42234.00
Sample Name:	Units	Chronic	Note	RW-6A-042115	RW-6A-080415	RW-6A-121415	RW-7(090414)	RW-7-042015	RW-7-080615	RW-8(163-173)(092214)	RW-8-(163-173)-081815
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	NA	NA	<0.57	NA	<0.4
Aroclor-1221	ug/L	--		NA	<0.34	NA	NA	NA	<0.45	NA	<0.31
Aroclor-1232	ug/L	--		NA	<0.4	NA	NA	NA	<0.53	NA	<0.37
Aroclor-1242	ug/L	--		NA	<0.22	NA	NA	NA	<0.29	NA	<0.2
Aroclor-1248	ug/L	--		NA	<0.15	NA	NA	NA	<0.2	NA	<0.14
Aroclor-1254	ug/L	--		NA	<0.17	NA	NA	NA	<0.22	NA	<0.16
Aroclor-1260	ug/L	--		NA	<0.18	NA	NA	NA	<0.24	NA	<0.17
Total PCBs	ug/L	--		NA	<0.5	NA	NA	NA	<0.66	NA	<0.4
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.25	<0.19	<0.28	NA	<0.25	<0.19	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.21	<0.19	<0.19	NA	<0.21	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.52	<0.15	<0.34	NA	<0.52	<0.15	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.21	<0.19	<0.08	NA	<0.21	<0.19	NA	<0.19
1,1-Dichloroethane	ug/L	--		<0.17	0.42 J	0.33 J	NA	<0.17	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.51	<0.25	<0.34	NA	<0.51	<0.25	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<2.1	NA	NA	NA	<2.1	NA	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.99	<0.01	<0.007	NA	<0.99	<0.01	NA	<0.01
1,2-Dibromoethane	ug/L	--		<0.23	<0.01	<0.006	NA	<0.23	<0.01	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.19	<0.22	NA	<0.19	<0.19	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.18	<0.2	<0.25	NA	<0.18	<0.2	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.39	<0.25	<0.18	NA	<0.39	<0.25	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.23	<0.18	<0.33	NA	<0.23	<0.18	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.27	0.27 J	<0.33	NA	<0.27	<0.17	NA	<0.17
2-Butanone	ug/L	--		<5.6	<2.6	<2.2	NA	<5.6	<2.6	NA	<2.6
2-Hexanone	ug/L	--		<1.7	<1.3	<0.72	NA	<1.7	<1.3	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		<1	<0.81	<0.63	NA	<1	<0.81	NA	<0.81
Acetone	ug/L	--		<3.3	<2.7	<1.1	NA	8.1 J	<2.7	NA	<2.7
Bromochloromethane	ug/L	--		NA	NA	<0.3	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.23	<0.17	<0.15	NA	<0.23	<0.17	NA	<0.17
Bromoform	ug/L	230	(c)	<0.23	<0.29	<0.18	NA	<0.23	<0.29	NA	<0.29
Bromomethane	ug/L	16	(c)	<0.42	<0.35	<0.18	NA	<0.42	<0.35	NA	<0.35
Carbon Disulfide	ug/L	--		<0.25	<0.22	<0.22	NA	<0.25	<0.22	NA	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.22	<0.18	<0.33	NA	<0.22	<0.18	NA	<0.18
Chlorobenzene	ug/L	47	(c)	<0.19	<0.18	<0.24	NA	<0.19	<0.18	NA	<0.18
Chloroethane	ug/L	--		2.3	2	4.6	NA	<0.34	<0.36	NA	<0.36
Chloroform	ug/L	140	(c)	<0.19	<0.23	<0.22	NA	<0.19	<0.23	NA	<0.23
Chloromethane	ug/L	--		<0.41	<0.36	<0.22	NA	<0.41	<0.36	NA	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.27	<0.21	<0.26	NA	<0.27	<0.21	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.21	<0.17	<0.16	NA	<0.21	<0.17	NA	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.15	<0.25	<0.22	NA	<0.15	<0.25	NA	<0.25

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-6A	RW-6A	RW-6A	RW-7	RW-7	RW-7	RW-8	RW-8
Sample Depth():				- -	- -	- -	- -	- -	- -	163 - 173	163 - 173
Date Collected:				42115.00	42220.00	42352.00	41886.00	42114.00	42222.00	41904.00	42234.00
Sample Name:	Units	Chronic	Note	RW-6A-042115	RW-6A-080415	RW-6A-121415	RW-7(090414)	RW-7-042015	RW-7-080615	RW-8(163-173)(092214)	RW-8-(163-173)-081815
Dichlorodifluoromethane	ug/L	--		<0.9	<0.17	<0.14	NA	<0.9	<0.17	NA	<0.17
Isopropylbenzene	ug/L	--		8.5	4.6	3.9	NA	<0.23	<0.33	NA	<0.33
Methyl acetate	ug/L	--		<1.9	<0.58	<0.58	NA	<1.9	<0.58	NA	<0.58
Methylcyclohexane	ug/L	--		1.5 J	0.74 J	0.95 J	NA	<0.22	<0.09	NA	<0.09
Methylene Chloride	ug/L	940	(c)	<0.73	<0.22	<0.21	NA	<0.73	<0.22	NA	<0.22
Styrene	ug/L	32	(c)	<0.27	<0.28	<0.17	NA	<0.27	<0.28	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.4	<0.14	<0.12	NA	<0.4	<0.14	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.65	<0.23	<0.18	NA	<0.65	<0.23	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.19	<0.17	<0.19	NA	<0.19	<0.17	NA	<0.17
Trichloroethene	ug/L	47	(c)	<0.22	<0.2	<0.22	NA	<0.22	<0.2	NA	<0.2
Trichlorofluoromethane	ug/L	--		<0.43	<0.21	<0.15	NA	<0.43	<0.21	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.15	<0.18	<0.06	NA	<0.15	<0.18	NA	<0.18
Benzene	ug/L	114	(c)	8.7	7.7	5.9	NA	<0.24	<0.2	NA	0.27 J
Toluene	ug/L	253	(c)	<0.16	<0.17	<0.25	NA	<0.16	<0.17	NA	<0.17
Ethylbenzene	ug/L	14	(c)	<0.27	<0.19	<0.3	NA	<0.27	<0.19	NA	<0.19
Xylenes (total)	ug/L	27	(c)	37.5	12	<0.28	NA	<0.17	<0.58	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.24	<0.17	<0.13	NA	<0.24	<0.17	NA	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	<0.35	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	NA	NA	<0.01	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.21	<0.2	<0.27	NA	<0.21	<0.2	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	2.7 J	1.28	NA	NA	<0.27	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.8	NA	NA	NA	<2.8	NA	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.9	NA	NA	NA	<6.9	NA	<6.9
2,4,5-Trichlorophenol	ug/L	--		NA	<7.1	NA	NA	NA	<7.1	NA	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.8	NA	NA	NA	<6.8	NA	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.6	NA	NA	NA	<5.6	NA	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	NA	<4.2	NA	NA	NA	<4.2	NA	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.9	NA	NA	NA	<5.9	NA	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3.2	NA	NA	NA	<3.2	NA	<3.2
2,6-Dinitrotoluene	ug/L	--		NA	<2.3	NA	NA	NA	<2.3	NA	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.8	NA	NA	NA	<2.8	NA	<2.8
2-Chlorophenol	ug/L	24	(c)	NA	<4.8	NA	NA	NA	<4.8	NA	<4.8
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.4	NA	NA	NA	<0.4	NA	<0.4
2-Methylphenol	ug/L	--		NA	<2.3	NA	NA	NA	<2.3	NA	<2.3
2-Nitroaniline	ug/L	--		NA	<3.7	NA	NA	NA	<3.7	NA	<3.7
2-Nitrophenol	ug/L	--		NA	<5.3	NA	NA	NA	<5.3	NA	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.3	NA	NA	NA	<3.3	NA	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2.2	NA	NA	NA	<2.2	NA	<2.2
3-Nitroaniline	ug/L	--		NA	<2.7	NA	NA	NA	<2.7	NA	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<9.3	NA	NA	NA	<9.3	NA	<9.3
4-Bromophenyl-phenylether	ug/L	--		NA	<2.7	NA	NA	NA	<2.7	NA	<2.7
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.5	NA	NA	NA	<4.5	NA	<4.5

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-6A - - 42115.00 RW-6A-042115	RW-6A - - 42220.00 RW-6A-080415	RW-6A - - 42352.00 RW-6A-121415	RW-7 - - 41886.00 RW-7(090414)	RW-7 - - 42114.00 RW-7-042015	RW-7 - - 42222.00 RW-7-080615	RW-8 163 - 173 41904.00 RW-8(163-173)(092214)	RW-8 163 - 173 42234.00 RW-8-(163-173)-081815
4-Chloroaniline	ug/L	--		NA	<4.2	NA	NA	NA	<4.2	NA	<4.2
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.8	NA	NA	NA	<2.8	NA	<2.8
4-Nitroaniline	ug/L	--		NA	<3.1	NA	NA	NA	<3.1	NA	<3.1
4-Nitrophenol	ug/L	60	(c)	NA	<5.4	NA	NA	NA	<5.4	NA	<5.4
Acenaphthene	ug/L	38	(c)	NA	<0.32	NA	NA	NA	<0.32	NA	<0.32
Acenaphthylene	ug/L	4840	(c)	NA	<0.35	NA	NA	NA	<0.35	NA	<0.35
Acetophenone	ug/L	--		NA	2.4 J	NA	NA	NA	<2.3	NA	<2.3
Anthracene	ug/L	0.035	(c)	NA	<0.38	NA	NA	NA	<0.38	NA	<0.38
Atrazine	ug/L	--		NA	<2.9	NA	NA	NA	<2.9	NA	<2.9
Benzaldehyde	ug/L	--		NA	<5.7	NA	NA	NA	<5.7	NA	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	NA	NA	<0.025	NA	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	NA	NA	<0.025	NA	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	NA	NA	<0.025	NA	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.62	NA	NA	NA	<0.62	NA	<0.62
Benzo(k)fluoranthene	ug/L	--		NA	<0.37	NA	NA	NA	<0.37	NA	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		NA	<3.1	NA	NA	NA	<3.1	NA	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	3.4 J	NA	NA	NA	<2.8	NA	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<6	NA	6.6	NA	<6	NA	<6
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.5	NA	NA	NA	<2.5	NA	<2.5
Caprolactam	ug/L	--		NA	<2.4	NA	NA	NA	<2.4	NA	<2.4
Carbazole	ug/L	--		NA	<2.8	NA	NA	NA	<2.8	NA	<2.8
Chrysene	ug/L	--		NA	<0.33	NA	NA	NA	<0.33	NA	<0.33
Cyclohexane	ug/L	--		4.2 J	4.1 J	2.3	NA	<0.28	<0.13	NA	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.45	NA	NA	NA	<0.45	NA	<0.45
Dibenzofuran	ug/L	--		NA	<2.9	NA	NA	NA	<2.9	NA	<2.9
Diethylphthalate	ug/L	110	(c)	NA	<3	NA	NA	NA	<3	NA	<3
Dimethylphthalate	ug/L	--		NA	<3.1	NA	NA	NA	<3.1	NA	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.5	NA	NA	NA	<2.5	NA	<2.5
Di-n-Octylphthalate	ug/L	--		NA	<2.5	NA	NA	NA	<2.5	NA	<2.5
Diphenyl ether	ug/L	--		NA	<2.2	NA	NA	NA	<2.2	NA	<2.2
Fluoranthene	ug/L	1.9	(c)	NA	<0.32	NA	NA	NA	<0.32	NA	<0.32
Fluorene	ug/L	19	(c)	NA	<0.32	NA	NA	NA	<0.32	NA	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	NA	NA	<0.014	NA	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	NA	NA	<0.2	NA	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.8	NA	NA	NA	<1.8	NA	<1.8
Hexachloroethane	ug/L	8	(c)	NA	<1.9	NA	NA	NA	<1.9	NA	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.41	NA	NA	NA	<0.41	NA	<0.41
Isophorone	ug/L	920	(c)	NA	<3.1	NA	NA	NA	<3.1	NA	<3.1
Naphthalene	ug/L	13	(c)	NA	5.6	NA	NA	NA	<0.37	NA	<0.37
Nitrobenzene	ug/L	220	(c)	NA	<2.7	NA	NA	NA	<2.7	NA	<2.7
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	NA	NA	<0.2	NA	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.4	NA	NA	NA	<3.4	NA	<3.4
N-Nitrosodiphenylamine	ug/L	--		NA	<3.6	NA	NA	NA	<3.6	NA	<3.6

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-6A / -- / 42115.00 / RW-6A-042115	RW-6A / -- / 42220.00 / RW-6A-080415	RW-6A / -- / 42352.00 / RW-6A-121415	RW-7 / -- / 41886.00 / RW-7(090414)	RW-7 / -- / 42114.00 / RW-7-042015	RW-7 / -- / 42222.00 / RW-7-080615	RW-8 / 163 - 173 / 41904.00 / RW-8(163-173)(092214)	RW-8 / 163 - 173 / 42234.00 / RW-8-(163-173)-081815
Pentachlorophenol	ug/L	--		NA	R	NA	NA	NA	<0.1	NA	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	<0.42	NA	NA	NA	<0.42	NA	<0.42
Phenol	ug/L	180	(c)	NA	<1.5	NA	NA	NA	<1.5	NA	<1.5
Pyrene	ug/L	0.3	(c)	NA	<0.35	NA	NA	NA	<0.35	NA	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	NA	9.80 J	NA	2,200	NA	380	NA	<9.60
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	NA	<0.500	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	<1.40 B	NA	3.60	NA	<0.740 B	4.20	3.60 B
Barium	ug/L	220	(c)	NA	48.0	NA	6.20	NA	2.10	12.7	12.0
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	80,700	85,500	NA	11,700	10,900	12,100	38,700	37,500
Chromium	ug/L	42	(c)	NA	0.800 J	NA	1.00	NA	<0.500	NA	<0.500
Cobalt	ug/L	24	(c)	NA	19.0	NA	NA	NA	<0.500	NA	<0.500
Copper	ug/L	5.56	(a)	NA	0.710 J	NA	4.10	NA	1.20 J	NA	<0.500
Iron	ug/L	--	(j)	24,000	22,200	NA	1,430	522	260	41.9	29.0
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	2.90	NA	0.480 J	NA	<0.200
Magnesium	ug/L	--	(j)	18,600	19,300	NA	4,170	<5,000	4,200	6,710	6,200
Manganese	ug/L	120	(i)	NA	15,700	11,700	31.5	NA	4.20 J	19.0	15.0
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	NA	3.30	NA	NA	NA	0.510 J	16.0	19.0
Potassium	ug/L	--	(j)	NA	2,800	NA	933	NA	900 J	2,640	2,500
Selenium	ug/L	5	(d)	NA	<0.600	NA	NA	NA	<0.600	NA	<0.600
Silver	ug/L	0.12	(c)	NA	<0.500	NA	2.30	NA	<0.500	1.30	<0.500
Sodium	ug/L	--	(j)	<10,000	8,200	NA	3,610	<10,000	4,200	57,800	52,400
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	NA	0.370 J	NA	<0.200
Vanadium	ug/L	12	(c)	NA	3.30 B	NA	1.10	NA	<1.90 B	NA	<1.20 B
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	10.4	NA	<10.0	NA	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.60	NA	1,240	NA	420	39.1	<9.60
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	NA	1.40 J	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	<1.10 B	NA	3.20	NA	<0.720 B	5.20	2.10
Barium	ug/L	220	(c)	NA	36.0	NA	3.20	NA	1.40 J	12.9	12.0
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	80,700	87,500	NA	11,100	11,700	11,600	38,500	35,000
Chromium	ug/L	42	(c)	NA	<0.500	NA	1.00	NA	<0.500	NA	<0.500
Cobalt	ug/L	24	(c)	NA	19.0	NA	NA	NA	<0.500	NA	<0.500
Copper	ug/L	5.56	(a)	NA	<0.500	NA	NA	NA	<0.500	NA	<0.500
Iron	ug/L	--	(j)	23,800	9,800	NA	626	<100	140	NA	17.0 J
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	NA	<0.200	NA	<0.200
Magnesium	ug/L	--	(j)	18,700	20,000	NA	3,940	<5,000	4,100	6,270	6,300
Manganese	ug/L	120	(i)	NA	14,200	NA	9.60	NA	1.90 J	17.3	16.0

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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-6A / -- / 42115.00 / RW-6A-042115	RW-6A / -- / 42220.00 / RW-6A-080415	RW-6A / -- / 42352.00 / RW-6A-121415	RW-7 / -- / 41886.00 / RW-7(090414)	RW-7 / -- / 42114.00 / RW-7-042015	RW-7 / -- / 42222.00 / RW-7-080615	RW-8 / 163 - 173 / 41904.00 / RW-8(163-173)(092214)	RW-8 / 163 - 173 / 42234.00 / RW-8-(163-173)-081815
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	NA	4.10	NA	NA	NA	<0.500	19.5	14.0
Potassium	ug/L	--	(j)	NA	2,800	NA	889	NA	860 J	2,760	2,200
Selenium	ug/L	5	(d)	NA	<0.600	NA	NA	NA	<0.600	NA	<0.600
Silver	ug/L	0.12	(c)	NA	<0.500	NA	1.80	NA	<0.500	NA	<0.500
Sodium	ug/L	--	(j)	<10,000	8,100	NA	3,680	<10,000	3,900	62,400	48,900
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	NA	0.640 J	NA	<0.200
Vanadium	ug/L	12	(c)	NA	<1.10 B	NA	1.00	NA	<1.80 B	NA	<1.30 B
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	NA	NA	<10.0	NA	<10.0
Miscellaneous											
Alkalinity	ug/L	--		NA	326,000	340,000	43,600	NA	40,800	93,300	72,800
Alkalinity, Bicarbonate	ug/L	--		332,000	326,000	NA	NA	39,200	40,800	NA	72,800
Alkalinity, Carbonate	ug/L	--		332,000	NA	NA	NA	39,200	NA	NA	NA
Bromide	ug/L	--		NA	NA	<81	NA	NA	NA	NA	NA
Chloride	ug/L	--		2,800 B	2,000	<30	NA	NA	1,860	11,000	11,100
Cyanide	ug/L	--		NA	<7	NA	NA	NA	<7 J	NA	<7
Fluoride, Total	ug/L	--		NA	NA	120	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	24,000	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		<100	NA	<21	NA	<100	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	<21	NA	NA	NA	NA	NA
Nitrite	ug/L	--		<10	NA	<29	NA	<10	NA	NA	NA
Sulfate	ug/L	--		<10,000	<600	770	NA	NA	10,800	131,000	162,000
Sulfide	ug/L	--		NA	NA	<820	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		413,000	NA	NA	NA	47,000	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	620	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	2,600	NA	NA	NA	NA	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-8	RW-8	RW-9	RW-9	RW-9A	RW-9A	RW-9A	RW-10
Sample Depth():				204 - 214	204 - 214	206 - 216	206 - 216	85 - 95	85 - 95	85 - 95	120 - 130
Date Collected:				41905.00	42236.00	41907.00	42237.00	41905.00	41906.00	42237.00	41899.00
Sample Name:	Units	Chronic	Note	RW-8(204-214)(092314)	RW-8-(204-214)-082015	RW-9(206-216)(092514)	RW-9-(206-216)-082115	RW-9A(85-95)(092314)	RW-9A(85-95)(092414)	RW-9A-(85-95)-082115	RW-10(120-130)(091714)
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	NA	NA	NA	<0.43	NA
Aroclor-1221	ug/L	--		NA	<0.34	NA	NA	NA	NA	<0.34	NA
Aroclor-1232	ug/L	--		NA	<0.4	NA	NA	NA	NA	<0.4	NA
Aroclor-1242	ug/L	--		NA	<0.22	NA	NA	NA	NA	<0.22	NA
Aroclor-1248	ug/L	--		NA	<0.15	NA	NA	NA	NA	<0.15	NA
Aroclor-1254	ug/L	--		NA	<0.17	NA	NA	NA	NA	<0.17	NA
Aroclor-1260	ug/L	--		NA	<0.18	NA	NA	NA	NA	<0.18	NA
Total PCBs	ug/L	--		NA	<0.43	NA	NA	NA	NA	<0.43	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.19	NA	<0.19	NA	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.19	NA	<0.19	NA	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.15	NA	<0.15	NA	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.19	NA	<0.19	NA	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		NA	<0.24	NA	<0.24	NA	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.25	NA	<0.25	NA	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<1.9	NA	<2.1	NA	NA	<1.9	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		NA	<0.01	NA	<0.01	NA	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.25	NA	<0.25	NA	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.18	NA	<0.18	NA	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
2-Butanone	ug/L	--		NA	<2.6	NA	<2.6	NA	NA	11 J	NA
2-Hexanone	ug/L	--		NA	<1.3	NA	<1.3	NA	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		NA	<0.81	NA	<0.81	NA	NA	<0.81	NA
Acetone	ug/L	--		NA	<4.1 B	NA	5.6 J	NA	NA	3.9 J	29.1
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
Bromoform	ug/L	230	(c)	NA	<0.29	NA	<0.29	NA	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	NA	<0.35	NA	<0.35 J	NA	NA	<0.35 J	NA
Carbon Disulfide	ug/L	--		NA	<0.22	NA	<0.22	NA	NA	<0.22	5.5
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.18	NA	<0.18	NA	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	NA	<0.18	NA	<0.18	NA	NA	<0.18	NA
Chloroethane	ug/L	--		NA	<0.36	NA	<0.36	NA	NA	<0.36	NA
Chloroform	ug/L	140	(c)	NA	<0.23	NA	<0.23	NA	NA	<0.23	NA
Chloromethane	ug/L	--		NA	<0.36 J	NA	<0.36 J	NA	NA	<0.36 J	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.21	NA	<0.21	NA	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	<0.25	NA	<0.25	NA	NA	<0.25	NA

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Sample Depth():				204 - 214	204 - 214	206 - 216	206 - 216	85 - 95	85 - 95	85 - 95	120 - 130
Date Collected:				41905.00	42236.00	41907.00	42237.00	41905.00	41906.00	42237.00	41899.00
Sample Name:	Units	Chronic	Note	RW-8(204-214)(092314)	RW-8-(204-214)-082015	RW-9(206-216)(092514)	RW-9-(206-216)-082115	RW-9A(85-95)(092314)	RW-9A(85-95)(092414)	RW-9A-(85-95)-082115	RW-10(120-130)(091714)
Dichlorodifluoromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
Isopropylbenzene	ug/L	--		NA	<0.33	NA	<0.33	NA	NA	<0.33	NA
Methyl acetate	ug/L	--		NA	<0.58 J	NA	<0.58 J	NA	NA	<0.58 J	NA
Methylcyclohexane	ug/L	--		NA	<0.09	NA	<0.09	NA	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	NA	<0.22	NA	<0.22	NA	NA	<0.22	NA
Styrene	ug/L	32	(c)	NA	<0.28	NA	<0.28	NA	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	NA	<0.14	NA	<0.14	NA	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.23	NA	<0.23	NA	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		NA	<0.21	NA	<0.21	NA	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	NA	<0.18	NA	<0.18	NA	NA	<0.18	NA
Benzene	ug/L	114	(c)	0.58	0.57 J	NA	<0.2	NA	NA	<0.2	NA
Toluene	ug/L	253	(c)	NA	<0.17	0.35	0.2 J	NA	NA	<0.17	0.23
Ethylbenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	NA	<0.58	NA	<0.58	NA	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.17	NA	<0.17	NA	NA	<0.17	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	NA	<0.27	NA	NA	<0.27	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.5	NA	<2.8	NA	NA	<2.6	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.3	NA	<6.9	NA	NA	<6.4	NA
2,4,5-Trichlorophenol	ug/L	--		NA	<6.5	NA	<7.1	NA	NA	<6.6	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.2	NA	<6.8	NA	NA	<6.3	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.1	NA	<5.6	NA	NA	<5.2	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	<3.8	NA	<4.2	NA	NA	<3.9	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.4	NA	<5.9	NA	NA	<5.5	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<2.9	NA	<3.2	NA	NA	<3	NA
2,6-Dinitrotoluene	ug/L	--		NA	<2.1	NA	<2.3	NA	NA	<2.1	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.5	NA	<2.8	NA	NA	<2.6	NA
2-Chlorophenol	ug/L	24	(c)	NA	<4.4	NA	<4.8	NA	NA	<4.4	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.36	NA	<0.4	NA	NA	<0.37	NA
2-Methylphenol	ug/L	--		NA	<2.1	NA	<2.3	NA	NA	<2.1	NA
2-Nitroaniline	ug/L	--		NA	<3.4	NA	<3.7	NA	NA	<3.4	NA
2-Nitrophenol	ug/L	--		NA	<4.8	NA	<5.3	NA	NA	<4.9	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3	NA	<3.3	NA	NA	<3.1	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2	NA	<2.2	NA	NA	<2	NA
3-Nitroaniline	ug/L	--		NA	<2.5	NA	<2.7	NA	NA	<2.5	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<8.5	NA	<9.3	NA	NA	<8.6	NA
4-Bromophenyl-phenylether	ug/L	--		NA	<2.5	NA	<2.7	NA	NA	<2.5	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.1	NA	<4.5	NA	NA	<4.2	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-8	RW-8	RW-9	RW-9	RW-9A	RW-9A	RW-9A	RW-10
Sample Depth():				204 - 214	204 - 214	206 - 216	206 - 216	85 - 95	85 - 95	85 - 95	120 - 130
Date Collected:				41905.00	42236.00	41907.00	42237.00	41905.00	41906.00	42237.00	41899.00
Sample Name:	Units	Chronic	Note	RW-8(204-214)(092314)	RW-8-(204-214)-082015	RW-9(206-216)(092514)	RW-9-(206-216)-082115	RW-9A(85-95)(092314)	RW-9A(85-95)(092414)	RW-9A-(85-95)-082115	RW-10(120-130)(091714)
4-Chloroaniline	ug/L	--		NA	<3.8	NA	<4.2	NA	NA	<3.9	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.5	NA	<2.8	NA	NA	<2.6	NA
4-Nitroaniline	ug/L	--		NA	<2.8	NA	<3.1	NA	NA	<2.9	NA
4-Nitrophenol	ug/L	60	(c)	NA	<4.9	NA	<5.4	NA	NA	<5	NA
Acenaphthene	ug/L	38	(c)	NA	<0.29	NA	<0.32	NA	NA	<0.3	NA
Acenaphthylene	ug/L	4840	(c)	NA	<0.32	NA	<0.35	NA	NA	<0.32	NA
Acetophenone	ug/L	--		NA	<2.1	NA	<2.3	NA	NA	<2.1	1.4
Anthracene	ug/L	0.035	(c)	NA	<0.35	NA	<0.38	NA	NA	<0.35	NA
Atrazine	ug/L	--		NA	<2.6	NA	<2.9	NA	NA	<2.7	NA
Benzaldehyde	ug/L	--		NA	<5.2	NA	<5.7	NA	NA	<5.3	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	R	NA	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	R	NA	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	R	NA	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.56	NA	<0.62	NA	NA	<0.57	NA
Benzo(k)fluoranthene	ug/L	--		NA	<0.34	NA	<0.37	NA	NA	<0.34	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	<2.8	NA	<3.1	NA	NA	<2.9	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.5	NA	<2.8	NA	NA	<2.6	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<5.5	NA	<6	NA	NA	<5.6	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.3	NA	<2.5	NA	NA	<2.3	NA
Caprolactam	ug/L	--		NA	<2.2	NA	<2.4	NA	NA	<2.2	NA
Carbazole	ug/L	--		NA	<2.5	NA	<2.8	NA	NA	<2.6	NA
Chrysene	ug/L	--		NA	<0.3	NA	<0.33	NA	NA	<0.31	NA
Cyclohexane	ug/L	--		NA	<0.13	NA	<0.13	NA	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.41	NA	<0.45	NA	NA	<0.42	NA
Dibenzofuran	ug/L	--		NA	<2.6	NA	<2.9	NA	NA	<2.7	NA
Diethylphthalate	ug/L	110	(c)	NA	<2.7	NA	<3	NA	NA	<2.8	NA
Dimethylphthalate	ug/L	--		NA	<2.8	NA	<3.1	NA	NA	<2.9	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.3	NA	<2.5	NA	NA	<2.3	NA
Di-n-Octylphthalate	ug/L	--		NA	<2.3	NA	<2.5	NA	NA	<2.3	NA
Diphenyl ether	ug/L	--		NA	<2	NA	<2.2	NA	NA	<2	NA
Fluoranthene	ug/L	1.9	(c)	NA	<0.29	NA	<0.32	NA	NA	<0.3	NA
Fluorene	ug/L	19	(c)	NA	<0.29	NA	<0.32	NA	NA	<0.3	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	R	NA	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	R	NA	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.6	NA	<1.8	NA	NA	<1.7	NA
Hexachloroethane	ug/L	8	(c)	NA	<1.7	NA	<1.9	NA	NA	<1.8	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.37	NA	<0.41	NA	NA	<0.38	NA
Isophorone	ug/L	920	(c)	NA	<2.8	NA	<3.1	NA	NA	<2.9	NA
Naphthalene	ug/L	13	(c)	NA	<0.34	NA	<0.37	NA	NA	<0.34	NA
Nitrobenzene	ug/L	220	(c)	NA	<2.5	NA	<2.7	NA	NA	<2.5	NA
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	R	NA	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.1	NA	<3.4	NA	NA	<3.1	NA
N-Nitrosodiphenylamine	ug/L	--		NA	<3.3	NA	<3.6	NA	NA	<3.3	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-8 / 204 - 214 / 41905.00 / RW-8(204-214)(092314)	RW-8 / 204 - 214 / 42236.00 / RW-8-(204-214)-082015	RW-9 / 206 - 216 / 41907.00 / RW-9(206-216)(092514)	RW-9 / 206 - 216 / 42237.00 / RW-9-(206-216)-082115	RW-9A / 85 - 95 / 41905.00 / RW-9A(85-95)(092314)	RW-9A / 85 - 95 / 41906.00 / RW-9A(85-95)(092414)	RW-9A / 85 - 95 / 42237.00 / RW-9A-(85-95)-082115	RW-10 / 120 - 130 / 41899.00 / RW-10(120-130)(091714)
Pentachlorophenol	ug/L	--		NA	<0.1	NA	R	NA	NA	<0.1	NA
Phenanthrene	ug/L	3.6	(c)	NA	<0.38	NA	<0.42	NA	0.185	<0.39	NA
Phenol	ug/L	180	(c)	NA	<1.4	NA	<1.5	NA	NA	<1.4	10.8
Pyrene	ug/L	0.3	(c)	NA	<0.32	NA	<0.35	NA	NA	<0.32	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	<9.60	119	100	NA	NA	59.0	263
Antimony	ug/L	80	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	3.60	2.00	7.30	3.00	5.30	NA	3.20	8.20
Barium	ug/L	220	(c)	34.6	37.0	50.0	35.0	14.9	NA	12.0	18.9
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	<0.400	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	57,300	67,500	75,400	27,600	24,700	NA	26,500	47,600
Chromium	ug/L	42	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Cobalt	ug/L	24	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	NA
Copper	ug/L	5.56	(a)	NA	1.10 J	NA	<0.500	NA	NA	<0.500	5.50
Iron	ug/L	--	(j)	627	1,500	622	92.0	328	NA	340	60.2
Lead	ug/L	5.4	(d) (e)	2.30	0.970 J	NA	<0.200	NA	NA	<0.200	6.30
Magnesium	ug/L	--	(j)	20,100	20,000	21,500	17,600	5,590	NA	5,600	51.2
Manganese	ug/L	120	(i)	257	310	262	4.60	50.5	NA	46.0	NA
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	58.9	35.0	1.70	0.570 J	4.50	NA	4.90	13.2
Potassium	ug/L	--	(j)	28,400	10,300	18,300	50,900	2,580	NA	2,700	32,000
Selenium	ug/L	5	(d)	NA	<0.600	NA	<0.600	NA	NA	<0.600	NA
Silver	ug/L	0.12	(c)	NA	<0.500	NA	<0.500	NA	NA	<0.500	3.80
Sodium	ug/L	--	(j)	88,400	87,500	139,000	162,000	7,540	NA	5,900	71,300
Thallium	ug/L	10	(c)	NA	<0.200	NA	<0.200	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	<1.40 B	NA	<1.50 B	NA	NA	<1.40 B	3.90
Zinc	ug/L	71.69	(a)	28.5	22.0 J	NA	<10.0	NA	NA	<10.0	13.8
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.60	112	NA	NA	NA	<9.60	225
Antimony	ug/L	80	(c)	NA	<0.500	NA	NA	NA	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	4.20	1.90 J	8.90	NA	3.70	NA	3.40	9.10
Barium	ug/L	220	(c)	34.2	41.0	44.6	NA	13.8	NA	12.0	17.3
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	NA	NA	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	NA	NA	NA	<0.400	NA
Calcium	ug/L	--	(j)	59,500	63,500	77,800	NA	24,400	NA	23,200	46,000
Chromium	ug/L	42	(c)	NA	<0.500	NA	NA	NA	NA	<0.500	NA
Cobalt	ug/L	24	(c)	NA	<0.500	NA	NA	NA	NA	<0.500	NA
Copper	ug/L	5.56	(a)	NA	<0.500	NA	NA	NA	NA	<0.500	NA
Iron	ug/L	--	(j)	51.2	240	37.4	NA	150	NA	60.0	NA
Lead	ug/L	5.4	(d) (e)	NA	<0.200	NA	NA	NA	NA	<0.200	NA
Magnesium	ug/L	--	(j)	21,000	20,900	21,000	NA	5,480	NA	5,100	NA
Manganese	ug/L	120	(i)	259	270	295	NA	49.1	NA	38.0	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-8 204 - 214 41905.00 RW-8(204-214)(092314)	RW-8 204 - 214 42236.00 RW-8-(204-214)-082015	RW-9 206 - 216 41907.00 RW-9(206-216)(092514)	RW-9 206 - 216 42237.00 RW-9-(206-216)-082115	RW-9A 85 - 95 41905.00 RW-9A(85-95)(092314)	RW-9A 85 - 95 41906.00 RW-9A(85-95)(092414)	RW-9A 85 - 95 42237.00 RW-9A-(85-95)-082115	RW-10 120 - 130 41899.00 RW-10(120-130)(091714)
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	NA	NA	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	35.3	24.0	NA	NA	4.40	NA	0.960 J	13.9
Potassium	ug/L	--	(j)	30,200	16,300	17,800	NA	2,570	NA	2,200	32,300
Selenium	ug/L	5	(d)	NA	<0.600	NA	NA	NA	NA	<0.600	NA
Silver	ug/L	0.12	(c)	NA	<0.500	NA	NA	NA	NA	<0.500	3.80
Sodium	ug/L	--	(j)	95,700	92,500	141,000	NA	7,440	NA	6,400	72,700
Thallium	ug/L	10	(c)	NA	<0.200	NA	NA	NA	NA	<0.200	NA
Vanadium	ug/L	12	(c)	NA	<1.10 B	NA	NA	NA	NA	<0.980 B	4.60
Zinc	ug/L	71.69	(a)	NA	<10.0	NA	NA	NA	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		NA	216,000	NA	NA	80,500	NA	76,600	144,000
Alkalinity, Bicarbonate	ug/L	--		NA	216,000	NA	NA	NA	NA	76,600	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		NA	55,200	NA	NA	2,100	NA	1,520	11,100
Cyanide	ug/L	--		NA	<7	NA	<7	NA	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		NA	149,000	NA	NA	14,600	NA	14,200	131,000
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-10	RW-10	RW-10	RW-10A	RW-10A	RW-10A	RW-10A	RW-11D
Sample Depth():				120 - 130	185 - 195	185 - 195	51 - 61	51 - 61	75 - 85	75 - 85	262 - 267
Date Collected:				42235.00	41899.00	42234.00	41900.00	42236.00	41900.00	42234.00	41897.00
Sample Name:	Units	Chronic	Note	RW-10-(120-130)-081915	RW-10(185-195)(091714)	RW-10-(185-195)-081815	RW-10A(51-61)(091814)	RW-10A-(51-61)-082015	RW-10A(75-85)(091814)	RW-10A-(75-85)-081815	RW-11D(262-267)(091514)
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	<0.4	NA	<0.4	NA	<0.43	NA
Aroclor-1221	ug/L	--		<0.34	NA	<0.31	NA	<0.31	NA	<0.34	NA
Aroclor-1232	ug/L	--		<0.4	NA	<0.37	NA	<0.37	NA	<0.4	NA
Aroclor-1242	ug/L	--		<0.22	NA	<0.2	NA	<0.2	NA	<0.22	NA
Aroclor-1248	ug/L	--		<0.15	NA	<0.14	NA	<0.14	NA	<0.15	NA
Aroclor-1254	ug/L	--		<0.17	NA	<0.16	NA	<0.16	NA	<0.17	NA
Aroclor-1260	ug/L	--		<0.18	NA	<0.17	NA	<0.17	NA	<0.18	NA
Total PCBs	ug/L	--		<0.43	NA	<0.4	NA	<0.4	NA	<0.43	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	NA	<0.15	NA	<0.15	NA	<0.15	NA
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,1-Dichloroethane	ug/L	--		<0.24	NA	<0.24	NA	<0.24	NA	<0.24	NA
1,1-Dichloroethene	ug/L	65	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	NA	<2.1	NA	<2.6	NA	<2.1	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dibromoethane	ug/L	--		<0.01	NA	<0.01	NA	<0.01	NA	<0.01	NA
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
1,2-Dichloroethane	ug/L	910	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,2-Dichloropropane	ug/L	360	(c)	<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
2-Butanone	ug/L	--		5.3 J	NA	<2.6	NA	<2.6	NA	<2.6	21.4
2-Hexanone	ug/L	--		<1.3	NA	<1.3	NA	<1.3	NA	<1.3	NA
4-Methyl-2-pentanone	ug/L	--		<0.81	NA	<0.81	NA	<0.81	NA	<0.81	NA
Acetone	ug/L	--		43	29.3	24 J	NA	<2.7	NA	<2.7	86.1
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Bromoform	ug/L	230	(c)	<0.29	NA	<0.29	NA	<0.29	NA	<0.29	NA
Bromomethane	ug/L	16	(c)	<0.35	NA	<0.35	NA	<0.35	NA	<0.35	NA
Carbon Disulfide	ug/L	--		3.2	2.7	1.6	NA	<0.22	NA	<0.22	5.7
Carbon Tetrachloride	ug/L	240	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chlorobenzene	ug/L	47	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Chloroethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36	NA	<0.36	NA
Chloroform	ug/L	140	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	NA
Chloromethane	ug/L	--		<0.36	NA	<0.36	NA	<0.36 J	NA	<0.36	NA
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	NA	<0.21	NA	<0.21	NA	<0.21	NA
cis-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	NA	<0.25	NA	<0.25	NA	<0.25	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-10	RW-10	RW-10	RW-10A	RW-10A	RW-10A	RW-10A	RW-11D
Sample Depth():				120 - 130	185 - 195	185 - 195	51 - 61	51 - 61	75 - 85	75 - 85	262 - 267
Date Collected:				42235.00	41899.00	42234.00	41900.00	42236.00	41900.00	42234.00	41897.00
Sample Name:	Units	Chronic	Note	RW-10-(120-130)-081915	RW-10(185-195)(091714)	RW-10-(185-195)-081815	RW-10A(51-61)(091814)	RW-10A-(51-61)-082015	RW-10A(75-85)(091814)	RW-10A-(75-85)-081815	RW-11D(262-267)(091514)
Dichlorodifluoromethane	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Isopropylbenzene	ug/L	--		<0.33	NA	<0.33	NA	<0.33	NA	<0.33	NA
Methyl acetate	ug/L	--		<0.58 J	NA	<0.58	NA	<0.58 J	NA	<0.58	NA
Methylcyclohexane	ug/L	--		<0.09	NA	<0.09	NA	<0.09	NA	<0.09	NA
Methylene Chloride	ug/L	940	(c)	<0.22	NA	<0.22	NA	<0.22	NA	<0.22	NA
Styrene	ug/L	32	(c)	<0.28	NA	<0.28	NA	<0.28	NA	<0.28	NA
Tetrachloroethene	ug/L	45	(c)	<0.14	NA	<0.14	NA	<0.14	NA	<0.14	NA
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	NA	<0.23	NA	<0.23	NA	<0.23	NA
trans-1,3-Dichloropropene	ug/L	--		<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Trichloroethene	ug/L	47	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
Trichlorofluoromethane	ug/L	--		<0.21	NA	<0.21	NA	<0.21	NA	<0.21	NA
Vinyl Chloride	ug/L	930	(c)	<0.18	NA	<0.18	NA	<0.18	NA	<0.18	NA
Benzene	ug/L	114	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	2
Toluene	ug/L	253	(c)	0.22 J	NA	<0.17	NA	<0.17	NA	<0.17	NA
Ethylbenzene	ug/L	14	(c)	<0.19	NA	<0.19	NA	<0.19	NA	<0.19	NA
Xylenes (total)	ug/L	27	(c)	<0.58	NA	<0.58	NA	<0.58	NA	<0.58	NA
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	NA	<0.17	NA	<0.17	NA	<0.17	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.016 B	NA	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	NA	<0.2	NA	<0.2	NA	<0.2	NA
1,4-Dioxane	ug/L	22000	(k)	<0.27	NA	<0.27	NA	<0.27	NA	<0.27	NA
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	NA	<2.8	NA	<3.5	NA	<2.8	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	NA	<6.9	NA	<8.6	NA	<6.9	NA
2,4,5-Trichlorophenol	ug/L	--		<7.1	NA	<7.1	NA	<8.9	NA	<7.1	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	NA	<6.8	NA	<8.5	NA	<6.8	NA
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	NA	<5.6	NA	<7	NA	<5.6	NA
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	NA	<4.2	NA	<5.3	NA	<4.2	NA
2,4-Dinitrophenol	ug/L	19	(c)	<5.9	NA	<5.9	NA	<7.4	NA	<5.9	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	NA	<3.2	NA	<4	NA	<3.2	NA
2,6-Dinitrotoluene	ug/L	--		<2.3	NA	<2.3	NA	<2.9	NA	<2.3	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	NA	<2.8	NA	<3.5	NA	<2.8	NA
2-Chlorophenol	ug/L	24	(c)	<4.8	NA	<4.8	NA	<6	NA	<4.8	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.4	NA	<0.4	NA	<0.5	NA	<0.4	NA
2-Methylphenol	ug/L	--		<2.3	NA	<2.3	NA	<2.9	NA	<2.3	NA
2-Nitroaniline	ug/L	--		<3.7	NA	<3.7	NA	<4.6	NA	<3.7	NA
2-Nitrophenol	ug/L	--		<5.3	NA	<5.3	NA	<6.6	NA	<5.3	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	NA	<3.3	NA	<4.1	NA	<3.3	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	NA	<2.2	NA	<2.8	NA	<2.2	NA
3-Nitroaniline	ug/L	--		<2.7	NA	<2.7	NA	<3.4	NA	<2.7	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	NA	<9.3	NA	<12	NA	<9.3	NA
4-Bromophenyl-phenylether	ug/L	--		<2.7	NA	<2.7	NA	<3.4	NA	<2.7	NA
4-Chloro-3-Methylphenol	ug/L	--		<4.5	NA	<4.5	NA	<5.6	NA	<4.5	NA

Appendix A
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Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-10	RW-10	RW-10	RW-10A	RW-10A	RW-10A	RW-10A	RW-11D
Sample Depth():				120 - 130	185 - 195	185 - 195	51 - 61	51 - 61	75 - 85	75 - 85	262 - 267
Date Collected:				42235.00	41899.00	42234.00	41900.00	42236.00	41900.00	42234.00	41897.00
Sample Name:	Units	Chronic	Note	RW-10-(120-130)-081915	RW-10(185-195)(091714)	RW-10-(185-195)-081815	RW-10A(51-61)(091814)	RW-10A-(51-61)-082015	RW-10A(75-85)(091814)	RW-10A-(75-85)-081815	RW-11D(262-267)(091514)
4-Chloroaniline	ug/L	--		<4.2	NA	<4.2	NA	<5.3	NA	<4.2	NA
4-Chlorophenyl-phenylether	ug/L	--		<2.8	NA	<2.8	NA	<3.5	NA	<2.8	NA
4-Nitroaniline	ug/L	--		<3.1	NA	<3.1	NA	<3.9	NA	<3.1	NA
4-Nitrophenol	ug/L	60	(c)	<5.4	NA	<5.4	NA	<6.8	NA	<5.4	NA
Acenaphthene	ug/L	38	(c)	<0.32	NA	<0.32	NA	<0.4	NA	<0.32	NA
Acenaphthylene	ug/L	4840	(c)	<0.35	NA	<0.35	NA	<0.44	NA	<0.35	NA
Acetophenone	ug/L	--		<2.3	0.56	<2.3	NA	<2.9	NA	<2.3	1.2
Anthracene	ug/L	0.035	(c)	<0.38	NA	<0.38	NA	<0.48	NA	<0.38	NA
Atrazine	ug/L	--		<2.9	NA	<2.9	NA	<3.6	NA	<2.9	NA
Benzaldehyde	ug/L	--		<5.7	NA	<5.7	NA	<7.1	NA	<5.7	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.024	NA	<0.022	NA	<0.025	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.024	NA	<0.022	NA	<0.025	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.024	NA	<0.022	NA	<0.025	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	NA	<0.62	NA	<0.78	NA	<0.62	NA
Benzo(k)fluoranthene	ug/L	--		<0.37	NA	<0.37	NA	<0.46	NA	<0.37	NA
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	NA	<3.1	NA	<3.9	NA	<3.1	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	NA	<2.8	NA	<3.5	NA	<2.8	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	NA	<6	NA	<7.5	NA	<6	NA
Butylbenzylphthalate	ug/L	23	(c)	<2.5	NA	<2.5	NA	<3.1	NA	<2.5	NA
Caprolactam	ug/L	--		<2.4	NA	<2.4	NA	<3	NA	<2.4	NA
Carbazole	ug/L	--		<2.8	NA	<2.8	NA	<3.5	NA	<2.8	NA
Chrysene	ug/L	--		<0.33	NA	<0.33	NA	<0.41	NA	<0.33	NA
Cyclohexane	ug/L	--		<0.13	NA	<0.13	NA	<0.13	NA	<0.13	NA
Dibenzo(a,h)anthracene	ug/L	--		<0.45	NA	<0.45	NA	<0.56	NA	<0.45	NA
Dibenzofuran	ug/L	--		<2.9	NA	<2.9	NA	<3.6	NA	<2.9	NA
Diethylphthalate	ug/L	110	(c)	<3	NA	<3	NA	<3.8	NA	<3	NA
Dimethylphthalate	ug/L	--		<3.1	NA	<3.1	NA	<3.9	NA	<3.1	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	NA	<2.5	NA	<3.1	NA	<2.5	1.2
Di-n-Octylphthalate	ug/L	--		<2.5	NA	<2.5	NA	<3.1	NA	<2.5	NA
Diphenyl ether	ug/L	--		<2.2	NA	<2.2	NA	<2.8	NA	<2.2	NA
Fluoranthene	ug/L	1.9	(c)	<0.32	NA	<0.32	NA	<0.4	NA	<0.32	NA
Fluorene	ug/L	19	(c)	<0.32	NA	<0.32	NA	<0.4	NA	<0.32	NA
Hexachlorobenzene	ug/L	0.0003	(c)	<0.013	NA	<0.012	NA	<0.014	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.19	NA	<0.17	NA	<0.2	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	NA	<1.8	NA	<2.3	NA	<1.8	NA
Hexachloroethane	ug/L	8	(c)	<1.9	NA	<1.9	NA	<2.4	NA	<1.9	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	NA	<0.41	NA	<0.51	NA	<0.41	NA
Isophorone	ug/L	920	(c)	<3.1	NA	<3.1	NA	<3.9	NA	<3.1	NA
Naphthalene	ug/L	13	(c)	<0.37	NA	<0.37	NA	<0.46	NA	<0.37	NA
Nitrobenzene	ug/L	220	(c)	<2.7	NA	<2.7	NA	<3.4	NA	<2.7	NA
N-Nitrosodimethylamine	ug/L	--		<0.19	NA	<0.17	NA	<0.2	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	NA	<3.4	NA	<4.3	NA	<3.4	NA
N-Nitrosodiphenylamine	ug/L	--		<3.6	NA	<3.6	NA	<4.5	NA	<3.6	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-10 120 - 130 42235.00 RW-10-(120-130)-081915	RW-10 185 - 195 41899.00 RW-10(185-195)(091714)	RW-10 185 - 195 42234.00 RW-10-(185-195)-081815	RW-10A 51 - 61 41900.00 RW-10A(51-61)(091814)	RW-10A 51 - 61 42236.00 RW-10A-(51-61)-082015	RW-10A 75 - 85 41900.00 RW-10A(75-85)(091814)	RW-10A 75 - 85 42234.00 RW-10A-(75-85)-081815	RW-11D 262 - 267 41897.00 RW-11D(262-267)(091514)
Pentachlorophenol	ug/L	--		<0.094	NA	<0.086	NA	<0.1	NA	<0.1	NA
Phenanthrene	ug/L	3.6	(c)	<0.42	0.296	<0.42	NA	<0.53	NA	<0.42	NA
Phenol	ug/L	180	(c)	8.6 J	3.6	3.3 J	NA	<1.9	NA	<1.5	NA
Pyrene	ug/L	0.3	(c)	<0.35	NA	<0.35	NA	<0.44	NA	<0.35	NA
Inorganics											
Aluminum	ug/L	87	(i)	170	316	170	47.3	<9.60	49.8	<9.60	2,940
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	7.50	7.90	6.70	NA	2.10	NA	2.00 B	NA
Barium	ug/L	220	(c)	17.0	11.1	11.0	15.0	16.0	7.10	7.10	1,050
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	0.800
Calcium	ug/L	--	(j)	50,800	43,100	47,700	61,100	61,400	51,900	51,400	457,000
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	18.7
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	4.30	3.80	NA	<0.500	NA
Copper	ug/L	5.56	(a)	<0.500	NA	<0.500	2.90	<0.500	1.30	4.00	6.10
Iron	ug/L	--	(j)	28.0	NA	14.0 J	1,030	700	22.1	29.0	963
Lead	ug/L	5.4	(d) (e)	<0.200	3.50	<0.200	NA	<0.200	3.00	0.820 J	NA
Magnesium	ug/L	--	(j)	<130	257	440 J	15,200	14,600	14,100	14,000	500
Manganese	ug/L	120	(i)	<0.500	NA	<0.500	2,880	2,100	9.00	1.90 J	16.8
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	13.0	4.80	3.70	27.7	29.0	10.4	5.90	23.5
Potassium	ug/L	--	(j)	28,600	14,500	11,700	3,420	3,000	1,970	2,200	146,000
Selenium	ug/L	5	(d)	3.30	NA	1.10 J	NA	<0.600	NA	<0.600	NA
Silver	ug/L	0.12	(c)	<0.500	3.30	<0.500	2.10	<0.500	2.10	<0.500	NA
Sodium	ug/L	--	(j)	65,800	54,400	39,000	30,600	27,600	5,030	5,000	245,000
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	8.80	2.30	2.40 B	NA	<1.70 B	NA	<1.40 B	2.50
Zinc	ug/L	71.69	(a)	<10.0	NA	<10.0	NA	<10.0	NA	13.0 J	19.6
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	130	276	180	33.0	<9.60	29.4	<9.60	224
Antimony	ug/L	80	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Arsenic	ug/L	150	(d) (e)	6.70	9.70	5.20	NA	1.50 J	NA	<0.500	NA
Barium	ug/L	220	(c)	15.0	9.80	11.0	13.9	14.0	6.60	6.90	1,200
Beryllium	ug/L	3.6	(c)	<0.500	NA	<0.500	NA	<0.500	NA	<0.500	NA
Cadmium	ug/L	0.17	(a)	<0.400	NA	<0.400	NA	<0.400	NA	<0.400	NA
Calcium	ug/L	--	(j)	46,000	42,400	47,200	62,400	66,300	52,000	50,200	485,000
Chromium	ug/L	42	(c)	<0.500	NA	<0.500	NA	0.810 J	NA	<0.500	2.80
Cobalt	ug/L	24	(c)	<0.500	NA	<0.500	3.30	4.80	NA	<0.500	NA
Copper	ug/L	5.56	(a)	<0.500	NA	<0.500	NA	1.50 J	2.80	1.90 J	2.90
Iron	ug/L	--	(j)	<10.0	NA	30.0	31.0	330	NA	<10.0	32.5
Lead	ug/L	5.4	(d) (e)	<0.200	2.50	<0.200	NA	<0.200	NA	0.260 J	NA
Magnesium	ug/L	--	(j)	<130	386	430 J	15,300	16,200	14,100	14,400	NA
Manganese	ug/L	120	(i)	<0.500	NA	<0.500	2,730	3,000	2.10	0.820 J	NA

Appendix A
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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-10 / 120 - 130 / 42235.00 / RW-10-(120-130)-081915	RW-10 / 185 - 195 / 41899.00 / RW-10(185-195)(091714)	RW-10 / 185 - 195 / 42234.00 / RW-10-(185-195)-081815	RW-10A / 51 - 61 / 41900.00 / RW-10A(51-61)(091814)	RW-10A / 51 - 61 / 42236.00 / RW-10A-(51-61)-082015	RW-10A / 75 - 85 / 41900.00 / RW-10A(75-85)(091814)	RW-10A / 75 - 85 / 42234.00 / RW-10A-(75-85)-081815	RW-11D / 262 - 267 / 41897.00 / RW-11D(262-267)(091514)
Mercury	ug/L	0.77	(d) (e)	<0.150	0.0850	<0.150	NA	<0.150	NA	<0.150	NA
Nickel	ug/L	31.24	(a)	11.0	3.60	3.10	11.1	15.0	6.20	5.80	21.8
Potassium	ug/L	--	(j)	24,600	13,000	11,900	3,380	3,000	1,950	2,100	164,000
Selenium	ug/L	5	(d)	2.70	NA	0.810 J	NA	<0.600	NA	<0.600	NA
Silver	ug/L	0.12	(c)	<0.500	2.50	<0.500	2.10	<0.500	NA	<0.500	NA
Sodium	ug/L	--	(j)	64,900	48,200	41,500	28,700	16,700	5,050	5,100	279,000
Thallium	ug/L	10	(c)	<0.200	NA	<0.200	NA	<0.200	NA	<0.200	NA
Vanadium	ug/L	12	(c)	7.10	1.50	2.80 B	NA	<0.900 B	NA	<1.50 B	1.50
Zinc	ug/L	71.69	(a)	<10.0	NA	<10.0	NA	49.0	NA	<10.0	NA
Miscellaneous											
Alkalinity	ug/L	--		121,000	95,800	69,500	197,000	207,000	165,000	147,000	1,900,000
Alkalinity, Bicarbonate	ug/L	--		<5,000	NA	<5,000	NA	207,000	NA	147,000	NA
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		8,090	4,800	4,610	3,500	2,610	3,000	3,020	33,000
Cyanide	ug/L	--		<7	NA	<7	NA	<7	NA	<7 J	NA
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		134,000	126,000	123,000	64,000	36,200	33,200	34,100	NA
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-11D 262 - 267 42242.00 RW-11D-(262-267)-082615	RW-11D 262 - 267 42355.00 RW-11D-121715	RW-11S 236 - 241 41894.00 DUP(091214)	RW-11S 236 - 241 41894.00 RW-11S(236-241)(091214)	RW-11S 236 - 241 42233.00 RW-11S-(236-241)-081715	RW-11S 236 - 241 42355.00 RW-11S-121715	RW-12 55 - 65 41901.00 RW-12(55-65)(091914)	RW-12 55 - 65 42233.00 RW-12-(55-65)-081715
PCBs											
Aroclor-1016	ug/L	--		<0.43	NA	NA	NA	<0.43	NA	NA	<0.43
Aroclor-1221	ug/L	--		<0.34	NA	NA	NA	<0.34	NA	NA	<0.34
Aroclor-1232	ug/L	--		<0.4	NA	NA	NA	<0.4	NA	NA	<0.4
Aroclor-1242	ug/L	--		<0.22	NA	NA	NA	<0.22	NA	NA	<0.22
Aroclor-1248	ug/L	--		<0.15	NA	NA	NA	<0.15	NA	NA	<0.15
Aroclor-1254	ug/L	--		<0.17	NA	NA	NA	<0.17	NA	NA	<0.17
Aroclor-1260	ug/L	--		<0.18	NA	NA	NA	<0.18	NA	NA	<0.18
Total PCBs	ug/L	--		<0.43	NA	NA	NA	<0.43	NA	NA	<0.43
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	<0.28	NA	NA	<0.19	<0.28	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	<0.19	NA	NA	<0.19	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	<0.34	NA	NA	<0.15	<0.34	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	<0.08	NA	NA	<0.19	<0.08	NA	<0.19
1,1-Dichloroethane	ug/L	--		<0.24	<0.24	NA	NA	<0.24	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.25	<0.34	NA	NA	<0.25	<0.34	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		<2.1	NA	NA	NA	<2.1	NA	NA	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	<0.007	NA	NA	<0.01	<0.007	NA	<0.01
1,2-Dibromoethane	ug/L	--		<0.01	<0.006	NA	NA	<0.01	<0.006	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.22	NA	NA	<0.19	<0.22	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.2	<0.25	NA	NA	<0.2	<0.25	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.25	<0.18	NA	NA	<0.25	<0.18	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	<0.33	NA	NA	<0.18	<0.33	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	<0.33	NA	NA	<0.17	<0.33	NA	<0.17
2-Butanone	ug/L	--		29 J	13	NA	NA	<2.6	<2.2	NA	<2.6
2-Hexanone	ug/L	--		<1.3	1.3 J	NA	NA	<1.3	<0.72	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		<0.81	0.68 J	NA	NA	<0.81	<0.63	NA	1 J
Acetone	ug/L	--		45	55	NA	NA	<2.7	<1.1	7.9	<8.3 B
Bromochloromethane	ug/L	--		NA	<0.3	NA	NA	NA	<0.3	NA	NA
Bromodichloromethane	ug/L	--		<0.17	<0.15	NA	NA	<0.17	<0.15	NA	<0.17
Bromoform	ug/L	230	(c)	<0.29	<0.18	NA	NA	<0.29	<0.18	NA	<0.29
Bromomethane	ug/L	16	(c)	<0.35	<0.18	NA	NA	<0.35	<0.18	NA	<0.35
Carbon Disulfide	ug/L	--		63	<0.22	NA	NA	<0.22	<0.22	NA	3.4
Carbon Tetrachloride	ug/L	240	(c)	<0.18	<0.33	NA	NA	<0.18	<0.33	NA	<0.18
Chlorobenzene	ug/L	47	(c)	0.22 J	1.1	NA	NA	<0.18	<0.24	NA	<0.18
Chloroethane	ug/L	--		<0.36	<0.37	NA	NA	<0.36	<0.37	NA	<0.36
Chloroform	ug/L	140	(c)	<0.23	<0.22	NA	NA	<0.23	<0.22	0.59	<0.23
Chloromethane	ug/L	--		<0.36	<0.22 J	NA	NA	<0.36	<0.22 J	NA	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.21	<0.26	NA	NA	<0.21	<0.26	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.17	<0.16	NA	NA	<0.17	<0.16	NA	<0.17
Cyclohexane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		<0.25	<0.22	NA	NA	<0.25	<0.22	NA	<0.25

Appendix A
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Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-11D	RW-11D	RW-11S	RW-11S	RW-11S	RW-11S	RW-12	RW-12
Sample Depth():				262 - 267	262 - 267	236 - 241	236 - 241	236 - 241	236 - 241	55 - 65	55 - 65
Date Collected:				42242.00	42355.00	41894.00	41894.00	42233.00	42355.00	41901.00	42233.00
Sample Name:	Units	Chronic	Note	RW-11D-(262-267)-082615	RW-11D-121715	DUP(091214)	RW-11S(236-241)(091214)	RW-11S-(236-241)-081715	RW-11S-121715	RW-12(55-65)(091914)	RW-12-(55-65)-081715
Dichlorodifluoromethane	ug/L	--		<0.17	<0.14	NA	NA	<0.17	<0.14	NA	<0.17
Isopropylbenzene	ug/L	--		<0.33	<0.32	NA	NA	<0.33	<0.32	NA	<0.33
Methyl acetate	ug/L	--		<0.58 J	<0.58 J	NA	NA	<0.58	<0.58 J	NA	<0.58
Methylcyclohexane	ug/L	--		<0.09	<0.22	NA	NA	<0.09	<0.22	NA	<0.09
Methylene Chloride	ug/L	940	(c)	<0.22	<0.21	NA	NA	<0.22	<0.21	NA	<0.22
Styrene	ug/L	32	(c)	<0.28	<0.17	NA	NA	<0.28	<0.17	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.14	<0.12	NA	NA	<0.14	<0.12	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	<0.18	NA	NA	<0.23	<0.18	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.17	<0.19	NA	NA	<0.17	<0.19	NA	<0.17
Trichloroethene	ug/L	47	(c)	<0.2	<0.22	NA	NA	<0.2	<0.22	NA	<0.2
Trichlorofluoromethane	ug/L	--		<0.21	<0.15	NA	NA	<0.21	<0.15	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.18	<0.06	NA	NA	<0.18	<0.06	NA	<0.18
Benzene	ug/L	114	(c)	1.6	2.4	NA	NA	<0.2	<0.09	NA	<0.2
Toluene	ug/L	253	(c)	<0.17	<0.25	NA	NA	<0.17	<0.25	6.4	3.6
Ethylbenzene	ug/L	14	(c)	<0.19	<0.3	NA	NA	<0.19	<0.3	NA	<0.19
Xylenes (total)	ug/L	27	(c)	<0.58	<0.28	NA	NA	<0.58	<0.28	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	<0.13	NA	NA	<0.17	<0.13	NA	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	<0.35	NA	NA	NA	<0.35	NA	NA
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	NA	NA	<0.01	NA	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	<0.27	NA	NA	<0.2	<0.27	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	26 J	17.9	NA	NA	1.1 J	1.88	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.8	NA	NA	NA	<2.8	NA	NA	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.9	NA	NA	NA	<6.9	NA	NA	<6.9
2,4,5-Trichlorophenol	ug/L	--		<7.1	NA	NA	NA	<7.1	NA	NA	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.8	NA	NA	NA	<6.8	NA	NA	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	<5.6	NA	NA	NA	<5.6	NA	NA	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	<4.2	NA	NA	NA	<4.2	NA	NA	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	6.6 J	NA	NA	NA	<5.9	NA	NA	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	<3.2	NA	NA	NA	<3.2	NA	NA	<3.2
2,6-Dinitrotoluene	ug/L	--		<2.3	NA	NA	NA	<2.3	NA	NA	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	<2.8	NA	NA	NA	<2.8	NA	NA	<2.8
2-Chlorophenol	ug/L	24	(c)	<4.8	NA	NA	NA	<4.8	NA	NA	<4.8
2-Methylnaphthalene	ug/L	330	(c)	<0.4	NA	NA	NA	<0.4	NA	NA	<0.4
2-Methylphenol	ug/L	--		<2.3	NA	NA	NA	<2.3	NA	NA	<2.3
2-Nitroaniline	ug/L	--		<3.7	NA	NA	NA	<3.7	NA	NA	<3.7
2-Nitrophenol	ug/L	--		<5.3	NA	NA	NA	<5.3	NA	NA	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<3.3	NA	NA	NA	<3.3	NA	NA	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		<2.2	NA	NA	NA	<2.2	NA	NA	<2.2
3-Nitroaniline	ug/L	--		<2.7	NA	NA	NA	<2.7	NA	NA	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		<9.3	NA	NA	NA	<9.3	NA	NA	<9.3
4-Bromophenyl-phenylether	ug/L	--		<2.7	NA	NA	NA	<2.7	NA	NA	<2.7
4-Chloro-3-Methylphenol	ug/L	--		<4.5	NA	NA	NA	<4.5	NA	NA	<4.5

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-11D	RW-11D	RW-11S	RW-11S	RW-11S	RW-11S	RW-12	RW-12
Sample Depth():				262 - 267	262 - 267	236 - 241	236 - 241	236 - 241	236 - 241	55 - 65	55 - 65
Date Collected:				42242.00	42355.00	41894.00	41894.00	42233.00	42355.00	41901.00	42233.00
Sample Name:	Units	Chronic	Note	RW-11D-(262-267)-082615	RW-11D-121715	DUP(091214)	RW-11S(236-241)(091214)	RW-11S-(236-241)-081715	RW-11S-121715	RW-12(55-65)(091914)	RW-12-(55-65)-081715
4-Chloroaniline	ug/L	--		<4.2	NA	NA	NA	<4.2	NA	NA	<4.2
4-Chlorophenyl-phenylether	ug/L	--		<2.8	NA	NA	NA	<2.8	NA	NA	<2.8
4-Nitroaniline	ug/L	--		<3.1	NA	NA	NA	<3.1	NA	NA	<3.1
4-Nitrophenol	ug/L	60	(c)	<5.4	NA	NA	NA	<5.4	NA	NA	<5.4
Acenaphthene	ug/L	38	(c)	<0.32	NA	NA	NA	<0.32	NA	NA	<0.32
Acenaphthylene	ug/L	4840	(c)	<0.35	NA	NA	NA	<0.35	NA	NA	<0.35
Acetophenone	ug/L	--		<2.3	NA	NA	NA	<2.3	NA	0.98	<2.3
Anthracene	ug/L	0.035	(c)	<0.38	NA	NA	NA	<0.38	NA	NA	<0.38
Atrazine	ug/L	--		<2.9	NA	NA	NA	<2.9	NA	NA	<2.9
Benzaldehyde	ug/L	--		<5.7	NA	NA	NA	<5.7	NA	NA	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	<0.025	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	<0.025	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.025	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.62	NA	NA	NA	<0.62	NA	NA	<0.62
Benzo(k)fluoranthene	ug/L	--		<0.37	NA	NA	NA	<0.37	NA	NA	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		<3.1	NA	NA	NA	<3.1	NA	NA	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.8	NA	NA	NA	<2.8	NA	NA	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<6	NA	NA	NA	<6	NA	NA	<6
Butylbenzylphthalate	ug/L	23	(c)	<2.5	NA	NA	NA	<2.5	NA	NA	<2.5
Caprolactam	ug/L	--		<2.4	NA	NA	NA	<2.4	NA	NA	<2.4
Carbazole	ug/L	--		<2.8	NA	NA	NA	<2.8	NA	NA	<2.8
Chrysene	ug/L	--		<0.33	NA	NA	NA	<0.33	NA	NA	<0.33
Cyclohexane	ug/L	--		<0.13	<0.26	NA	NA	<0.13	<0.26	NA	0.17 J
Dibenzo(a,h)anthracene	ug/L	--		<0.45	NA	NA	NA	<0.45	NA	NA	<0.45
Dibenzofuran	ug/L	--		<2.9	NA	NA	NA	<2.9	NA	NA	<2.9
Diethylphthalate	ug/L	110	(c)	<3	NA	NA	NA	<3	NA	NA	<3
Dimethylphthalate	ug/L	--		<3.1	NA	NA	NA	<3.1	NA	NA	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.5	NA	NA	NA	<2.5	NA	NA	<2.5
Di-n-Octylphthalate	ug/L	--		<2.5	NA	NA	NA	<2.5	NA	NA	<2.5
Diphenyl ether	ug/L	--		<2.2	NA	NA	NA	<2.2	NA	NA	<2.2
Fluoranthene	ug/L	1.9	(c)	<0.32	NA	NA	NA	<0.32	NA	NA	<0.32
Fluorene	ug/L	19	(c)	<0.32	NA	NA	NA	<0.32	NA	NA	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	<0.014	NA	NA	NA	<0.014	NA	NA	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	<0.2	NA	NA	NA	<0.2	NA	NA	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.8	NA	NA	NA	<1.8	NA	NA	<1.8
Hexachloroethane	ug/L	8	(c)	<1.9	NA	NA	NA	<1.9	NA	NA	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.41	NA	NA	NA	<0.41	NA	NA	<0.41
Isophorone	ug/L	920	(c)	<3.1	NA	NA	NA	<3.1	NA	3.1	<3.1
Naphthalene	ug/L	13	(c)	<0.37	NA	NA	NA	<0.37	NA	NA	<0.37
Nitrobenzene	ug/L	220	(c)	<2.7	NA	NA	NA	<2.7	NA	NA	<2.7
N-Nitrosodimethylamine	ug/L	--		<0.2	NA	NA	NA	<0.2	NA	NA	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		<3.4	NA	NA	NA	<3.4	NA	NA	<3.4
N-Nitrosodiphenylamine	ug/L	--		<3.6	NA	NA	NA	<3.6	NA	NA	<3.6

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Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-11D 262 - 267 42242.00 RW-11D-(262-267)-082615	RW-11D 262 - 267 42355.00 RW-11D-121715	RW-11S 236 - 241 41894.00 DUP(091214)	RW-11S 236 - 241 41894.00 RW-11S(236-241)(091214)	RW-11S 236 - 241 42233.00 RW-11S-(236-241)-081715	RW-11S 236 - 241 42355.00 RW-11S-121715	RW-12 55 - 65 41901.00 RW-12(55-65)(091914)	RW-12 55 - 65 42233.00 RW-12-(55-65)-081715
Pentachlorophenol	ug/L	--		<0.1	NA	NA	NA	<0.1	NA	NA	<0.1
Phenanthrene	ug/L	3.6	(c)	<0.42	NA	NA	NA	<0.42	NA	NA	<0.42
Phenol	ug/L	180	(c)	2.3 J	NA	NA	NA	<1.5	NA	3.1	3 J
Pyrene	ug/L	0.3	(c)	<0.35	NA	NA	NA	<0.35	NA	NA	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	730	NA	NA	NA	<9.60	NA	691	280
Antimony	ug/L	80	(c)	<0.500	NA	NA	NA	<0.500	NA	NA	<0.500
Arsenic	ug/L	150	(d) (e)	2.40	NA	NA	NA	1.00 J	NA	NA	13.0
Barium	ug/L	220	(c)	540	NA	14.1	15.8	15.0	NA	39.3	25.0
Beryllium	ug/L	3.6	(c)	<0.500	NA	NA	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	<0.400	NA	NA	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	383,000	NA	13,800	13,800	16,100	NA	86,200	72,700
Chromium	ug/L	42	(c)	40.0	NA	NA	NA	<0.500	NA	32.4	<0.500
Cobalt	ug/L	24	(c)	<0.500	NA	NA	NA	<0.500	NA	NA	<0.500
Copper	ug/L	5.56	(a)	3.20	NA	NA	NA	7.00	NA	3.70	<0.500
Iron	ug/L	--	(j)	490	NA	195	267	57.0	NA	80.6	19.0 J
Lead	ug/L	5.4	(d) (e)	0.690 J	NA	NA	NA	<0.200	NA	NA	<0.200
Magnesium	ug/L	--	(j)	<130	NA	1,930	1,950	2,200	NA	NA	<130
Manganese	ug/L	120	(i)	6.30	<3.00	71.5	74.1	220	234	NA	<0.500
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	NA	NA	0.180 J	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	17.0	NA	9.10	12.3	3.90	NA	NA	3.30
Potassium	ug/L	--	(j)	117,000	NA	1,270	1,260	1,500	NA	92,300	39,300
Selenium	ug/L	5	(d)	1.00 J	NA	NA	NA	<0.600	NA	14.1	9.90
Silver	ug/L	0.12	(c)	<0.500	NA	1.70	1.60	<0.500	NA	2.50	<0.500
Sodium	ug/L	--	(j)	210,000	NA	3,280	3,420	3,100	NA	138,000	170,000
Thallium	ug/L	10	(c)	<0.200	NA	NA	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	2.40 B	NA	NA	NA	2.40 B	NA	35.7	6.80 B
Zinc	ug/L	71.69	(a)	<10.0	NA	13.6	17.3	15.0 J	NA	NA	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	65.0 J	NA	NA	NA	<9.60	NA	684	240
Antimony	ug/L	80	(c)	<2.50	NA	NA	NA	<0.500	NA	NA	<0.500
Arsenic	ug/L	150	(d) (e)	<2.50	NA	NA	NA	<0.500	NA	2.60	12.0
Barium	ug/L	220	(c)	570	NA	14.9	14.6	15.0	NA	40.5	24.0
Beryllium	ug/L	3.6	(c)	<2.50	NA	NA	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	<2.00	NA	NA	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	439,000	NA	14,900	14,500	15,200	NA	91,400	57,700
Chromium	ug/L	42	(c)	30.0	NA	NA	NA	<0.500	NA	34.0	<0.500
Cobalt	ug/L	24	(c)	<2.50	NA	NA	NA	<0.500	NA	NA	<0.500
Copper	ug/L	5.56	(a)	<2.50	NA	NA	NA	4.10	NA	3.80	<0.500
Iron	ug/L	--	(j)	<50.0	NA	NA	NA	<10.0	NA	87.5	11.0 J
Lead	ug/L	5.4	(d) (e)	<1.00	NA	NA	NA	<0.200	NA	NA	<0.200
Magnesium	ug/L	--	(j)	<630	NA	2,060	1,980	2,200	NA	NA	<130
Manganese	ug/L	120	(i)	<2.50	NA	81.2	75.5	200	NA	NA	0.710 J

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Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	 Note	RW-11D 262 - 267 42242.00 RW-11D-(262-267)-082615	RW-11D 262 - 267 42355.00 RW-11D-121715	RW-11S 236 - 241 41894.00 DUP(091214)	RW-11S 236 - 241 41894.00 RW-11S(236-241)(091214)	RW-11S 236 - 241 42233.00 RW-11S-(236-241)-081715	RW-11S 236 - 241 42355.00 RW-11S-121715	RW-12 55 - 65 41901.00 RW-12(55-65)(091914)	RW-12 55 - 65 42233.00 RW-12-(55-65)-081715
Mercury	ug/L	0.77	(d) (e)	<0.150	NA	NA	NA	<0.150	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	15.0	NA	5.00	5.30	2.70	NA	NA	2.20
Potassium	ug/L	--	(j)	123,000	NA	1,300	1,240	1,400	NA	96,600	34,800
Selenium	ug/L	5	(d)	<3.00	NA	NA	NA	<0.600	NA	14.1	8.80
Silver	ug/L	0.12	(c)	<2.50	NA	1.50	1.80	<0.500	NA	2.90	<0.500
Sodium	ug/L	--	(j)	209,000	NA	3,140	3,030	3,000	NA	140,000	NA
Thallium	ug/L	10	(c)	<1.00	NA	NA	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	<1.30 B	NA	NA	NA	<1.10 B	NA	35.2	4.80
Zinc	ug/L	71.69	(a)	<50.0	NA	27.5	18.7	13.0 J	NA	NA	<10.0
Miscellaneous											
Alkalinity	ug/L	--		1,300,000	663,000	43,600	43,100	49,000	50,000	290,000	101,000
Alkalinity, Bicarbonate	ug/L	--		<5,000	NA	NA	NA	49,000	NA	NA	<5,000
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	<81	NA	NA	NA	<81	NA	NA
Chloride	ug/L	--		40,500	43,600	NA	NA	820 J	740	48,600	47,200
Cyanide	ug/L	--		<7	NA	NA	NA	<7	NA	NA	<7
Fluoride, Total	ug/L	--		NA	<15	NA	NA	NA	<15	NA	NA
Methane	ug/L	--		NA	5,300	NA	NA	NA	97	NA	NA
Nitrate and Nitrite	ug/L	--		NA	100	NA	NA	NA	<21	NA	NA
Nitrate-N	ug/L	--		NA	100	NA	NA	NA	<21	NA	NA
Nitrite	ug/L	--		NA	<29	NA	NA	NA	<29	NA	NA
Sulfate	ug/L	--		40,600	15,400	NA	NA	7,210	7,190	269,000	299,000
Sulfide	ug/L	--		NA	5,500	NA	NA	NA	<820	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	1,300	NA	NA	NA	<140	NA	NA
Total Organic Carbon	ug/L	--		NA	9,300	NA	NA	NA	630 J	NA	NA

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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-12	RW-12	RW-13	RW-13	RW-13	RW-13	RW-13	RW-13
Sample Depth():				130 - 140	130 - 140	71 - 91	71 - 91	100 - 120	100 - 120	150 - 170	150 - 170
Date Collected:				41901.00	42228.00	41891.00	42240.00	41898.00	42229.00	41898.00	42228.00
Sample Name:	Units	Chronic	Note	RW-12(130-140)(091914)	RW-12-(130-140)-081215	RW-13(71-91)(090914)	RW-13-(71-91)-082415	RW-13(100-120)(091614)	RW-13-(100-120)-081315	RW-13(150-170)(091614)	RW-13-(150-170)-081215
PCBs											
Aroclor-1016	ug/L	--		NA	<0.43	NA	<0.41	NA	<0.43	NA	<0.43
Aroclor-1221	ug/L	--		NA	<0.34	NA	<0.33	NA	<0.34	NA	<0.34
Aroclor-1232	ug/L	--		NA	<0.4	NA	<0.38	NA	<0.4	NA	<0.4
Aroclor-1242	ug/L	--		NA	<0.22	NA	<0.21	NA	<0.22	NA	<0.22
Aroclor-1248	ug/L	--		NA	<0.15	NA	<0.14	NA	<0.15	NA	<0.15
Aroclor-1254	ug/L	--		NA	<0.17	NA	<0.16	NA	<0.17	NA	<0.17
Aroclor-1260	ug/L	--		NA	<0.18	NA	<0.17	NA	<0.18	NA	<0.18
Total PCBs	ug/L	--		NA	<0.43	NA	<0.41	NA	<0.43	NA	<0.43
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	<0.15	NA	<0.15	NA	<0.15	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,1-Dichloroethane	ug/L	--		NA	<0.24	NA	<0.24	NA	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<2.1	NA	<1.9	NA	<2.1	NA	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2-Dibromoethane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
2-Butanone	ug/L	--		NA	<2.6	NA	<2.6	NA	3.2 J	NA	<2.6
2-Hexanone	ug/L	--		NA	<1.3	NA	<1.3	NA	<1.3	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		NA	<0.81	NA	<0.81	NA	<0.81	NA	<0.81
Acetone	ug/L	--		6.1	<2.7	4.9	<2.7	17.1	41	NA	<2.7
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Bromoform	ug/L	230	(c)	NA	<0.29	NA	<0.29	NA	<0.29	NA	<0.29
Bromomethane	ug/L	16	(c)	NA	<0.35	NA	<0.35	NA	<0.35 J	NA	<0.35
Carbon Disulfide	ug/L	--		NA	0.27 J	NA	<0.22	NA	<0.22	NA	<0.22
Carbon Tetrachloride	ug/L	240	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Chlorobenzene	ug/L	47	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Chloroethane	ug/L	--		NA	<0.36	NA	<0.36	NA	<0.36	NA	<0.36
Chloroform	ug/L	140	(c)	0.21	<0.23	NA	<0.23	NA	<0.23	NA	<0.23
Chloromethane	ug/L	--		NA	<0.36	NA	<0.36 J	NA	<0.36	NA	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	<0.21	NA	<0.21	NA	<0.21	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Cyclohexane	ug/L	--		0.42	NA	NA	NA	NA	NA	0.57	NA
Dibromochloromethane	ug/L	--		NA	<0.25	NA	<0.25	NA	<0.25	NA	<0.25

ED_001829_00000091-00164

Location ID: Sample Depth(): Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	RW-12 130 - 140 41901.00 RW-12(130-140)(091914)	RW-12 130 - 140 42228.00 RW-12-(130-140)-081215	RW-13 71 - 91 41891.00 RW-13(71-91)(090914)	RW-13 71 - 91 42240.00 RW-13-(71-91)-082415	RW-13 100 - 120 41898.00 RW-13(100-120)(091614)	RW-13 100 - 120 42229.00 RW-13-(100-120)-081315	RW-13 150 - 170 41898.00 RW-13(150-170)(091614)	RW-13 150 - 170 42228.00 RW-13-(150-170)-081215
Dichlorodifluoromethane	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Isopropylbenzene	ug/L	--		NA	<0.33	NA	<0.33	NA	<0.33	NA	<0.33
Methyl acetate	ug/L	--		NA	<0.58	NA	<0.58 J	NA	<0.58	NA	<0.58
Methylcyclohexane	ug/L	--		NA	<0.09	NA	<0.09	NA	<0.09	NA	<0.09
Methylene Chloride	ug/L	940	(c)	NA	<0.22 B	NA	<0.22	NA	<0.22	NA	<0.34 B
Styrene	ug/L	32	(c)	NA	<0.28	NA	<0.28	NA	<0.28	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	NA	<0.14	NA	<0.14	NA	<0.14	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	<0.23	NA	<0.23	NA	<0.23	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Trichloroethene	ug/L	47	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
Trichlorofluoromethane	ug/L	--		NA	<0.21	NA	<0.21	NA	<0.21	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	NA	<0.18	NA	<0.18	NA	<0.18	NA	<0.18
Benzene	ug/L	114	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
Toluene	ug/L	253	(c)	0.45	<0.17	0.53	<0.17	1.7	<0.65 B	0.73	<0.17
Ethylbenzene	ug/L	14	(c)	NA	<0.19	NA	<0.19	NA	<0.19	NA	<0.19
Xylenes (total)	ug/L	27	(c)	NA	<0.58	NA	<0.58	NA	<0.58	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	NA	<0.17	NA	<0.17	NA	<0.17	NA	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	<0.01	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	<0.2	NA	<0.2	NA	<0.2	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	NA	<0.27	NA	<0.27	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.8	NA	<2.6 J	NA	<2.8	NA	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.9	NA	<6.4	NA	<6.9	NA	<6.9
2,4,5-Trichlorophenol	ug/L	--		NA	<7.1	NA	<6.6	NA	<7.1	NA	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.8	NA	<6.3	NA	<6.8	NA	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.6	NA	<5.2	NA	<5.6	NA	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	NA	<4.2	NA	<3.9	NA	<4.2	NA	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.9	NA	<5.5	NA	<5.9	NA	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<3.2	NA	<3	NA	<3.2	NA	<3.2
2,6-Dinitrotoluene	ug/L	--		NA	<2.3	NA	<2.1	NA	<2.3	NA	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.8	NA	<2.6	NA	<2.8	NA	<2.8
2-Chlorophenol	ug/L	24	(c)	NA	<4.8	NA	<4.4	NA	<4.8	NA	<4.8
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.4	NA	<0.37	NA	<0.4	NA	<0.4
2-Methylphenol	ug/L	--		NA	<2.3	NA	<2.1	NA	<2.3	NA	<2.3
2-Nitroaniline	ug/L	--		NA	<3.7	NA	<3.4	NA	<3.7	NA	<3.7
2-Nitrophenol	ug/L	--		NA	<5.3	NA	<4.9	NA	<5.3	NA	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3.3	NA	<3.1	NA	<3.3	NA	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2.2	NA	<2	NA	<2.2	NA	<2.2
3-Nitroaniline	ug/L	--		NA	<2.7	NA	<2.5	NA	<2.7	NA	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<9.3	NA	<8.6	NA	<9.3	NA	<9.3
4-Bromophenyl-phenylether	ug/L	--		NA	<2.7	NA	<2.5	NA	<2.7	NA	<2.7
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.5	NA	<4.2	NA	<4.5	NA	<4.5

Appendix A
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Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-12	RW-12	RW-13	RW-13	RW-13	RW-13	RW-13	RW-13
Sample Depth():				130 - 140	130 - 140	71 - 91	71 - 91	100 - 120	100 - 120	150 - 170	150 - 170
Date Collected:				41901.00	42228.00	41891.00	42240.00	41898.00	42229.00	41898.00	42228.00
Sample Name:	Units	Chronic	Note	RW-12(130-140)(091914)	RW-12-(130-140)-081215	RW-13(71-91)(090914)	RW-13-(71-91)-082415	RW-13(100-120)(091614)	RW-13-(100-120)-081315	RW-13(150-170)(091614)	RW-13-(150-170)-081215
4-Chloroaniline	ug/L	--		NA	<4.2	NA	<3.9	NA	<4.2	NA	<4.2
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.8	NA	<2.6	NA	<2.8	NA	<2.8
4-Nitroaniline	ug/L	--		NA	<3.1	NA	<2.9	NA	<3.1	NA	<3.1
4-Nitrophenol	ug/L	60	(c)	NA	<5.4	NA	<5	NA	<5.4	NA	<5.4
Acenaphthene	ug/L	38	(c)	NA	<0.32	NA	<0.3	NA	<0.32	NA	<0.32
Acenaphthylene	ug/L	4840	(c)	NA	<0.35	NA	<0.32	NA	<0.35	NA	<0.35
Acetophenone	ug/L	--		NA	<2.3	NA	<2.1	0.96	<2.3	NA	<2.3
Anthracene	ug/L	0.035	(c)	NA	<0.38	NA	<0.35	NA	<0.38	NA	<0.38
Atrazine	ug/L	--		NA	<2.9	NA	<2.7	NA	<2.9	NA	<2.9
Benzaldehyde	ug/L	--		NA	<5.7	NA	<5.3	NA	<5.7	NA	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	<0.022	NA	<0.025	NA	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	<0.022	NA	<0.025	NA	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	<0.022	NA	<0.025	NA	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.62	NA	<0.57	NA	<0.62	NA	<0.62
Benzo(k)fluoranthene	ug/L	--		NA	<0.37	NA	<0.34	NA	<0.37	NA	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		NA	<3.1	NA	<2.9	NA	<3.1	NA	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.8	NA	<2.6	NA	<2.8	NA	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<6	59.3	<5.6	NA	<6	NA	<6
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.5	NA	<2.3	NA	<2.5	NA	<2.5
Caprolactam	ug/L	--		NA	<2.4	NA	<2.2	NA	<2.4	NA	<2.4
Carbazole	ug/L	--		NA	<2.8	NA	<2.6	NA	<2.8	NA	<2.8
Chrysene	ug/L	--		NA	<0.33	NA	<0.31	NA	<0.33	NA	<0.33
Cyclohexane	ug/L	--		NA	0.66 J	NA	<0.13	NA	0.14 J	NA	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.45	NA	<0.42	NA	<0.45	NA	<0.45
Dibenzofuran	ug/L	--		NA	<2.9	NA	<2.7	NA	<2.9	NA	<2.9
Diethylphthalate	ug/L	110	(c)	NA	<3	NA	<2.8	NA	<3	NA	<3
Dimethylphthalate	ug/L	--		NA	<3.1	6.9	<2.9	NA	<3.1	NA	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.5	NA	<2.3	NA	<2.5	NA	<2.5
Di-n-Octylphthalate	ug/L	--		NA	<2.5	NA	<2.3	NA	<2.5	NA	<2.5
Diphenyl ether	ug/L	--		NA	<2.2	NA	<2	NA	<2.2	NA	<2.2
Fluoranthene	ug/L	1.9	(c)	NA	<0.32	NA	<0.3	NA	<0.32	NA	<0.32
Fluorene	ug/L	19	(c)	NA	<0.32	NA	<0.3	NA	<0.32	NA	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	<0.012	NA	<0.014	NA	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	<0.17	NA	<0.2	NA	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.8	NA	<1.7	NA	<1.8	NA	<1.8
Hexachloroethane	ug/L	8	(c)	NA	<1.9	NA	<1.8	NA	<1.9	NA	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.41	NA	<0.38	NA	<0.41	NA	<0.41
Isophorone	ug/L	920	(c)	NA	<3.1	NA	<2.9	3.8	<3.1	NA	<3.1
Naphthalene	ug/L	13	(c)	NA	<0.37	NA	<0.34	NA	<0.37	NA	<0.37
Nitrobenzene	ug/L	220	(c)	NA	<2.7	NA	<2.5	NA	<2.7	NA	<2.7
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	<0.17	NA	<0.2	NA	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.4	NA	<3.1	NA	<3.4	NA	<3.4
N-Nitrosodiphenylamine	ug/L	--		NA	<3.6	NA	<3.3	NA	<3.6	NA	<3.6

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Appendix A
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Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-12	RW-12	RW-13	RW-13	RW-13	RW-13	RW-13	RW-13
Sample Depth():				130 - 140	130 - 140	71 - 91	71 - 91	100 - 120	100 - 120	150 - 170	150 - 170
Date Collected:				41901.00	42228.00	41891.00	42240.00	41898.00	42229.00	41898.00	42228.00
Sample Name:	Units	Chronic	Note	RW-12(130-140)(091914)	RW-12-(130-140)-081215	RW-13(71-91)(090914)	RW-13-(71-91)-082415	RW-13(100-120)(091614)	RW-13-(100-120)-081315	RW-13(150-170)(091614)	RW-13-(150-170)-081215
Pentachlorophenol	ug/L	--		NA	<0.1	NA	<0.086	NA	<0.1	NA	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	<0.42	NA	<0.39	NA	<0.42	NA	<0.42
Phenol	ug/L	180	(c)	NA	<1.5	NA	<1.4	5.7	6.6 J	NA	<1.5
Pyrene	ug/L	0.3	(c)	NA	<0.35	NA	<0.32	NA	<0.35	NA	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	1,200	900	360	1,700	114	5,600	46.2	530
Antimony	ug/L	80	(c)	NA	<0.500	3.10	<0.500	NA	<0.500	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	13.0	6.30	2.90	NA	3.20	NA	4.60
Barium	ug/L	220	(c)	43.0	15.0	51.0	59.0	99.7	24.0	37.5	31.0
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	<0.400	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	96,600	44,700	25,400	49,600	144,000	24,900	29,400	31,900
Chromium	ug/L	42	(c)	1.10	<0.500	41.1	8.00	191	55.0	NA	0.900 J
Cobalt	ug/L	24	(c)	NA	<0.500	NA	0.590 J	NA	<0.500	NA	<0.500
Copper	ug/L	5.56	(a)	30.5	<0.500	2.00	4.80	14.2	19.0	NA	0.740 J
Iron	ug/L	--	(j)	225	110	316	4,300	NA	380	184	650
Lead	ug/L	5.4	(d) (e)	NA	<0.200	3.70	2.30	NA	<0.200	1.70	0.330 J
Magnesium	ug/L	--	(j)	246	140 J	9,420	14,800	NA	<130	5,660	6,800
Manganese	ug/L	120	(i)	8.40	2.70 B	8.40	56.0	NA	<0.600 B	75.7	92.0
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	14.2	2.40	1.60	3.00	NA	2.80	2.10	8.40
Potassium	ug/L	--	(j)	25,000	10,400	138,000	47,500	210,000	232,000	2,330	1,800
Selenium	ug/L	5	(d)	7.50	3.80	9.40	3.10	24.0	12.0	NA	<0.600
Silver	ug/L	0.12	(c)	1.80	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Sodium	ug/L	--	(j)	139,000	98,800	32,200	19,400	222,000	246,000	30,300	9,900
Thallium	ug/L	10	(c)	NA	<0.200	NA	0.200 J	NA	0.900 J	NA	<0.200
Vanadium	ug/L	12	(c)	18.7	15.0	9.00	6.70	3.60	39.0	NA	2.00 B
Zinc	ug/L	71.69	(a)	8.30	<10.0	NA	<10.0	NA	<10.0	NA	<10.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	958	300	88.2	38.0	115	4,800	31.9	<9.60
Antimony	ug/L	80	(c)	NA	<0.500	NA	0.750 J	NA	0.630 J	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	<0.500	4.90	2.00	NA	2.10	2.90	2.00
Barium	ug/L	220	(c)	39.1	8.90	44.5	46.0	93.8	21.0	34.0	360
Beryllium	ug/L	3.6	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	<0.400	NA	<0.400	NA	<0.400	NA	<0.400
Calcium	ug/L	--	(j)	93,600	14,200	24,100	47,900	128,000	26,200	28,300	92,900 J
Chromium	ug/L	42	(c)	NA	0.540 J	40.3	0.520 J	179	50.0	NA	<0.500
Cobalt	ug/L	24	(c)	NA	<0.500	NA	<0.500	NA	<0.500	NA	<50.0
Copper	ug/L	5.56	(a)	NA	0.740 J	2.40	1.10 J	NA	13.0	NA	0.840 J
Iron	ug/L	--	(j)	49.4	320	32.6	41.0	162	310	NA	2,700
Lead	ug/L	5.4	(d) (e)	NA	<0.200	3.70	<0.200	NA	<0.200	NA	0.310 J
Magnesium	ug/L	--	(j)	NA	4,000	9,090	15,300	44.9	<130	5,480	24,500 J
Manganese	ug/L	120	(i)	NA	6.70	NA	36.0	NA	<0.500	71.5	220

Appendix A
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Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		RW-12	RW-12	RW-13	RW-13	RW-13	RW-13	RW-13	RW-13
Sample Depth():				130 - 140	130 - 140	71 - 91	71 - 91	100 - 120	100 - 120	150 - 170	150 - 170
Date Collected:				41901.00	42228.00	41891.00	42240.00	41898.00	42229.00	41898.00	42228.00
Sample Name:	Units	Chronic	Note	RW-12(130-140)(091914)	RW-12-(130-140)-081215	RW-13(71-91)(090914)	RW-13-(71-91)-082415	RW-13(100-120)(091614)	RW-13-(100-120)-081315	RW-13(150-170)(091614)	RW-13-(150-170)-081215
Mercury	ug/L	0.77	(d) (e)	NA	<0.150	NA	<0.150	NA	<0.150	NA	<0.150
Nickel	ug/L	31.24	(a)	NA	<0.500	1.70	1.10 J	NA	1.60 J	1.70	0.930 J
Potassium	ug/L	--	(j)	25,700	1,300	132,000	48,600	197,000	209,000	2,120	9,300
Selenium	ug/L	5	(d)	8.30	<0.600	10.1	3.00 B	22.3	11.0	NA	<0.600
Silver	ug/L	0.12	(c)	1.90	<0.500	NA	<0.500	NA	<0.500	NA	<0.500
Sodium	ug/L	--	(j)	143,000	3,900	30,600	20,300	213,000	210,000	27,900	153,000
Thallium	ug/L	10	(c)	NA	<0.200	NA	<0.200	NA	0.890 J	NA	<0.200
Vanadium	ug/L	12	(c)	19.3	2.20 B	7.90	2.20 B	3.00	35.0	NA	2.00 B
Zinc	ug/L	71.69	(a)	NA	<10.0	9.80	<10.0	NA	<10.0	8.20	<10.0
Miscellaneous											
Alkalinity	ug/L	--		397,000	159,000	128,000	146,000	97,400	547,000	720,000	96,400
Alkalinity, Bicarbonate	ug/L	--		NA	<5,000	NA	146,000	NA	<5,000	NA	96,400
Alkalinity, Carbonate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Chloride	ug/L	--		32,400	21,500	43,500	37,700	55,600	25,900	13,900	3,660
Cyanide	ug/L	--		NA	<7	NA	7.2 J	NA	<7 J	NA	<7
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	ug/L	--		108,000	145,000	144,000	63,000	164,000	50,700	47,100	16,500
Sulfide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	SC-01 / -- / 41887.00 / SC-1(090514)	SC-01 / -- / 41921.00 / SC-1(100914)	SC-01 / -- / 42116.00 / DUP-042215	SC-01 / -- / 42116.00 / SC-1-042215	SC-01 / -- / 42220.00 / SC-1-080415	SC-01 / -- / 42353.00 / SC-01-121515	SC-02 / -- / 41897.00 / SC-2(091514)	SC-02 / -- / 42228.00 / SC-2-081215
PCBs											
Aroclor-1016	ug/L	--		NA	NA	NA	NA	<0.43	NA	NA	<0.43
Aroclor-1221	ug/L	--		NA	NA	NA	NA	<0.34	NA	NA	<0.34
Aroclor-1232	ug/L	--		NA	NA	NA	NA	<0.4	NA	NA	<0.4
Aroclor-1242	ug/L	--		NA	NA	NA	NA	<0.22	NA	NA	<0.22
Aroclor-1248	ug/L	--		NA	NA	NA	NA	<0.15	NA	NA	<0.15
Aroclor-1254	ug/L	--		NA	NA	NA	NA	<0.17	NA	NA	<0.17
Aroclor-1260	ug/L	--		NA	NA	NA	NA	<0.18	NA	NA	<0.18
Total PCBs	ug/L	--		NA	NA	NA	NA	<0.5	NA	NA	<0.43
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	NA	NA	<0.25	<0.25	<0.19	<0.28	NA	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	NA	NA	<0.21	<0.21	<0.19	<0.19	NA	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		NA	NA	<0.52	<0.52	<0.15	<0.34	NA	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	NA	NA	<0.21	<0.21	<0.19	<0.08	NA	<0.19
1,1-Dichloroethane	ug/L	--		NA	NA	<0.17	<0.17	<0.24	<0.24	NA	<0.24
1,1-Dichloroethene	ug/L	65	(c)	NA	NA	<0.51	<0.51	<0.25	<0.34	NA	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	NA	NA	NA	<2.1	NA	NA	<2.1
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	ug/L	--		NA	NA	<0.99	<0.99	<0.01	<0.007	NA	<0.01
1,2-Dibromoethane	ug/L	--		NA	NA	<0.23	<0.23	<0.01	<0.006	NA	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	NA	NA	<0.19	<0.19	<0.19	<0.22	NA	<0.19
1,2-Dichloroethane	ug/L	910	(c)	NA	NA	<0.18	<0.18	<0.2	<0.25	NA	<0.2
1,2-Dichloropropane	ug/L	360	(c)	NA	NA	<0.39	<0.39	<0.25	<0.18	NA	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	NA	NA	<0.23	<0.23	<0.18	<0.33	NA	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	NA	NA	<0.27	<0.27	<0.17	<0.33	NA	<0.17
2-Butanone	ug/L	--		NA	NA	<5.6	<5.6	<2.6	<2.2	NA	<2.6
2-Hexanone	ug/L	--		NA	NA	<1.7	<1.7	<1.3	<0.72	NA	<1.3
4-Methyl-2-pentanone	ug/L	--		NA	NA	<1	<1	<0.81	<0.63	NA	<0.81
Acetone	ug/L	--		NA	NA	<3.3	<3.3	<2.7	<1.1	NA	<2.7
Bromochloromethane	ug/L	--		NA	NA	NA	NA	NA	<0.3	NA	NA
Bromodichloromethane	ug/L	--		NA	NA	<0.23	<0.23	<0.17	<0.15	NA	<0.17
Bromoform	ug/L	230	(c)	NA	NA	<0.23	<0.23	<0.29	<0.18	NA	<0.29
Bromomethane	ug/L	16	(c)	NA	NA	<0.42	<0.42	<0.35	<0.18	NA	<0.35
Carbon Disulfide	ug/L	--		NA	NA	<0.25	<0.25	<0.22	<0.22	NA	<0.22
Carbon Tetrachloride	ug/L	240	(c)	NA	NA	<0.22	<0.22	<0.18	<0.33	NA	<0.18
Chlorobenzene	ug/L	47	(c)	NA	NA	0.33 J	0.3 J	0.21 J	<0.24	NA	<0.18
Chloroethane	ug/L	--		NA	NA	1.7	1.8	0.53 J	2.5	NA	<0.36
Chloroform	ug/L	140	(c)	NA	NA	<0.19	<0.19	<0.23	<0.22	NA	<0.23
Chloromethane	ug/L	--		NA	NA	<0.41	<0.41	<0.36	<0.22	NA	<0.36
cis-1,2-Dichloroethene	ug/L	590	(i)	NA	NA	<0.27	<0.27	<0.21	<0.26	NA	<0.21
cis-1,3-Dichloropropene	ug/L	--		NA	NA	<0.21	<0.21	<0.17	<0.16	NA	<0.17
Cyclohexane	ug/L	--		NA	1.6	NA	NA	NA	NA	NA	NA
Dibromochloromethane	ug/L	--		NA	NA	<0.15	<0.15	<0.25	<0.22	NA	<0.25

Location ID:		Ecologically Based Screening Levels (EBSLs)		SC-01	SC-01	SC-01	SC-01	SC-01	SC-01	SC-02	SC-02
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41887.00	41921.00	42116.00	42116.00	42220.00	42353.00	41897.00	42228.00
Sample Name:	Units	Chronic	Note	SC-1(090514)	SC-1(100914)	DUP-042215	SC-1-042215	SC-1-080415	SC-01-121515	SC-2(091514)	SC-2-081215
Dichlorodifluoromethane	ug/L	--		NA	NA	<0.9	<0.9	<0.17	<0.14	NA	<0.17
Isopropylbenzene	ug/L	--		0.8	1.9	1.8	1.9	1.6	2.2	NA	<0.33
Methyl acetate	ug/L	--		NA	NA	<1.9	<1.9	<0.58	<0.58	NA	<0.58
Methylcyclohexane	ug/L	--		NA	1.4	1.6 J	1.6 J	1.1 J	1.6	NA	<0.09
Methylene Chloride	ug/L	940	(c)	NA	NA	<0.73	<0.73	<0.22	<0.21	NA	<0.23 B
Styrene	ug/L	32	(c)	NA	NA	<0.27	<0.27	<0.28	<0.17	NA	<0.28
Tetrachloroethene	ug/L	45	(c)	NA	NA	<0.4	<0.4	<0.14	<0.12	NA	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	NA	NA	<0.65	<0.65	<0.23	<0.18	NA	<0.23
trans-1,3-Dichloropropene	ug/L	--		NA	NA	<0.19	<0.19	<0.17	<0.19	NA	<0.17
Trichloroethene	ug/L	47	(c)	NA	NA	<0.22	<0.22	<0.2	<0.22	NA	<0.2
Trichlorofluoromethane	ug/L	--		NA	NA	<0.43	<0.43	<0.21	<0.15 J	NA	<0.21
Vinyl Chloride	ug/L	930	(c)	NA	NA	<0.15	<0.15	<0.18	<0.06	NA	<0.18
Benzene	ug/L	114	(c)	56	1.6	1.8	1.7	1.3	2.9	NA	<0.2
Toluene	ug/L	253	(c)	NA	NA	0.44 J	0.48 J	0.61 J	0.3 J	NA	<0.17
Ethylbenzene	ug/L	14	(c)	NA	0.64	3.3	3.3	2	2.5	NA	<0.19
Xylenes (total)	ug/L	27	(c)	0.84	40.6	73.5	75.6	60	180	NA	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	NA	NA	<0.24	<0.24	<0.17	<0.13	NA	<0.17
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	NA	NA	NA	<0.35 J	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	NA	NA	NA	<0.01	NA	NA	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	NA	NA	<0.21	<0.21	<0.2	<0.27	NA	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	NA	NA	NA	0.39 J	1.3	NA	<0.27
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	<2.8
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	NA	NA	NA	<6.9	NA	NA	<6.9
2,4,5-Trichlorophenol	ug/L	--		NA	NA	NA	NA	<7.1	NA	NA	<7.1
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	NA	NA	NA	<6.8	NA	NA	<6.8
2,4-Dichlorophenol	ug/L	11	(c)	NA	NA	NA	NA	<5.6	NA	NA	<5.6
2,4-Dimethylphenol	ug/L	100	(c)	NA	NA	NA	NA	<4.2	NA	NA	<4.2
2,4-Dinitrophenol	ug/L	19	(c)	NA	NA	NA	NA	<5.9	NA	NA	<5.9
2,4-Dinitrotoluene	ug/L	44	(c)	NA	NA	NA	NA	<3.2	NA	NA	<3.2
2,6-Dinitrotoluene	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	<2.3
2-Chloronaphthalene	ug/L	0.396	(c)	NA	NA	NA	NA	<2.8	NA	NA	<2.8
2-Chlorophenol	ug/L	24	(c)	NA	NA	NA	NA	<4.8	NA	NA	<4.8
2-Methylnaphthalene	ug/L	330	(c)	NA	NA	NA	NA	<0.4	NA	NA	<0.4
2-Methylphenol	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	<2.3
2-Nitroaniline	ug/L	--		NA	NA	NA	NA	<3.7	NA	NA	<3.7
2-Nitrophenol	ug/L	--		NA	NA	NA	NA	<5.3	NA	NA	<5.3
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	NA	NA	NA	<3.3	NA	NA	<3.3
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	NA	NA	NA	<2.2	NA	NA	<2.2
3-Nitroaniline	ug/L	--		NA	NA	NA	NA	<2.7	NA	NA	<2.7
4,6-Dinitro-2-methylphenol	ug/L	--		NA	NA	NA	NA	<9.3	NA	NA	<9.3
4-Bromophenyl-phenylether	ug/L	--		NA	NA	NA	NA	<2.7	NA	NA	<2.7
4-Chloro-3-Methylphenol	ug/L	--		NA	NA	NA	NA	<4.5	NA	NA	<4.5

Appendix A
2014 - 2016 Groundwater Monitoring Results
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Ringwood, New Jersey

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	SC-01 / -- / 41887.00 / SC-1(090514)	SC-01 / -- / 41921.00 / SC-1(100914)	SC-01 / -- / 42116.00 / DUP-042215	SC-01 / -- / 42116.00 / SC-1-042215	SC-01 / -- / 42220.00 / SC-1-080415	SC-01 / -- / 42353.00 / SC-01-121515	SC-02 / -- / 41897.00 / SC-2(091514)	SC-02 / -- / 42228.00 / SC-2-081215
4-Chloroaniline	ug/L	--		NA	NA	NA	NA	<4.2	NA	NA	<4.2
4-Chlorophenyl-phenylether	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	<2.8
4-Nitroaniline	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	<3.1
4-Nitrophenol	ug/L	60	(c)	NA	NA	NA	NA	<5.4	NA	NA	<5.4
Acenaphthene	ug/L	38	(c)	NA	NA	NA	NA	<0.32	NA	NA	<0.32
Acenaphthylene	ug/L	4840	(c)	NA	NA	NA	NA	<0.35	NA	NA	<0.35
Acetophenone	ug/L	--		NA	NA	NA	NA	<2.3	NA	NA	<2.3
Anthracene	ug/L	0.035	(c)	NA	NA	NA	NA	<0.38	NA	NA	<0.38
Atrazine	ug/L	--		NA	NA	NA	NA	<2.9	NA	NA	<2.9
Benzaldehyde	ug/L	--		NA	NA	NA	NA	<5.7	NA	NA	<5.7
Benzo(a)anthracene	ug/L	0.025	(c)	NA	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	NA	NA	NA	<0.025	NA	NA	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	NA	NA	NA	<0.62	NA	NA	<0.81 B
Benzo(k)fluoranthene	ug/L	--		NA	NA	NA	NA	<0.37	NA	NA	<0.37
bis(2-Chloroethoxy)methane	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	<3.1
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	NA	NA	NA	2.9 J	NA	NA	<2.8
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	NA	NA	NA	<6	NA	NA	<6
Butylbenzylphthalate	ug/L	23	(c)	NA	NA	NA	NA	<2.5	NA	NA	<2.5
Caprolactam	ug/L	--		NA	NA	NA	NA	<2.4	NA	NA	<2.4
Carbazole	ug/L	--		NA	NA	NA	NA	<2.8	NA	NA	<2.8
Chrysene	ug/L	--		NA	NA	NA	NA	<0.33	NA	NA	<0.33
Cyclohexane	ug/L	--		NA	NA	1.6 J	1.7 J	2 J	3.5 J	NA	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	NA	NA	NA	<0.45	NA	NA	<0.45
Dibenzofuran	ug/L	--		NA	NA	NA	NA	<2.9	NA	NA	<2.9
Diethylphthalate	ug/L	110	(c)	NA	NA	NA	NA	<3	NA	NA	<3
Dimethylphthalate	ug/L	--		NA	NA	NA	NA	<3.1	NA	NA	<3.1
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	NA	NA	NA	<2.5	NA	1.9	<2.5
Di-n-Octylphthalate	ug/L	--		NA	NA	NA	NA	<2.5	NA	NA	<2.5
Diphenyl ether	ug/L	--		NA	NA	NA	NA	<2.2	NA	NA	<2.2
Fluoranthene	ug/L	1.9	(c)	NA	NA	NA	NA	<0.32	NA	NA	<0.32
Fluorene	ug/L	19	(c)	NA	NA	NA	NA	<0.32	NA	NA	<0.32
Hexachlorobenzene	ug/L	0.0003	(c)	NA	NA	NA	NA	<0.014	NA	NA	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	NA	NA	NA	<0.2	NA	NA	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	NA	NA	NA	<1.8	NA	NA	<1.8
Hexachloroethane	ug/L	8	(c)	NA	NA	NA	NA	<1.9	NA	NA	<1.9
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	NA	NA	NA	<0.41	NA	NA	<0.41
Isophorone	ug/L	920	(c)	NA	NA	NA	NA	<3.1	NA	NA	<3.1
Naphthalene	ug/L	13	(c)	0.638	4.88	NA	NA	5.5	NA	NA	<0.37
Nitrobenzene	ug/L	220	(c)	NA	NA	NA	NA	<2.7	NA	NA	<2.7
N-Nitrosodimethylamine	ug/L	--		NA	NA	NA	NA	<0.2	NA	NA	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	NA	NA	NA	<3.4	NA	NA	<3.4
N-Nitrosodiphenylamine	ug/L	--		NA	1.5	NA	NA	<3.6	NA	NA	<3.6

Location ID: / Sample Depth(): / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Note	SC-01 / -- / 41887.00 / SC-1(090514)	SC-01 / -- / 41921.00 / SC-1(100914)	SC-01 / -- / 42116.00 / DUP-042215	SC-01 / -- / 42116.00 / SC-1-042215	SC-01 / -- / 42220.00 / SC-1-080415	SC-01 / -- / 42353.00 / SC-01-121515	SC-02 / -- / 41897.00 / SC-2(091514)	SC-02 / -- / 42228.00 / SC-2-081215
Pentachlorophenol	ug/L	--		NA	NA	NA	NA	R	NA	NA	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	0.126	NA	NA	<0.42	NA	NA	<0.42
Phenol	ug/L	180	(c)	NA	NA	NA	NA	<1.5	NA	NA	3.1 J
Pyrene	ug/L	0.3	(c)	NA	NA	NA	NA	<0.35	NA	NA	<0.35
Inorganics											
Aluminum	ug/L	87	(i)	54.2	71.2	NA	NA	56.0	NA	124	88.0
Antimony	ug/L	80	(c)	NA	NA	NA	NA	<0.500	NA	NA	<0.770 B
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	<1.10 B	NA	NA	2.10 B
Barium	ug/L	220	(c)	140	395	NA	NA	460	NA	39.0	32.0
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	10,800	33,400	41,400	41,000	42,500	NA	63,400	65,700
Chromium	ug/L	42	(c)	4.40	5.20	NA	NA	3.80	NA	NA	0.520 J
Cobalt	ug/L	24	(c)	NA	1.90	NA	NA	3.40	NA	NA	1.90 J
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	0.530 J	NA	6.60	3.00
Iron	ug/L	--	(j)	21,000	65,900	84,400	84,200	70,100	NA	484	300
Lead	ug/L	5.4	(d) (e)	NA	2.50	NA	NA	13.0	NA	NA	0.580 J
Magnesium	ug/L	--	(j)	1,510	4,040	<5,000	<5,000	4,400	NA	14,900	15,200
Manganese	ug/L	120	(i)	208	617	NA	NA	750	856	29.0	210
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	<0.150	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	NA	6.60	NA	NA	13.0	NA	2.50	3.00
Potassium	ug/L	--	(j)	1,490	2,410	NA	NA	2,400	NA	3,170	2,700
Selenium	ug/L	5	(d)	NA	NA	NA	NA	<0.600	NA	NA	<0.600
Silver	ug/L	0.12	(c)	NA	NA	NA	NA	<0.500	NA	NA	<0.500
Sodium	ug/L	--	(j)	2,040	3,720	<10,000	<10,000	4,100	NA	7,500	7,300
Thallium	ug/L	10	(c)	NA	NA	NA	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	2.20	2.70	NA	NA	3.90 B	NA	NA	<1.50 B
Zinc	ug/L	71.69	(a)	21.5	20.7	NA	NA	34.0	NA	36.9	30.0
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	18.1	NA	NA	NA	<9.60	NA	58.0	<9.60
Antimony	ug/L	80	(c)	NA	NA	NA	NA	0.500 J	NA	NA	<0.500
Arsenic	ug/L	150	(d) (e)	NA	NA	NA	NA	<0.840 B	NA	3.10	4.60
Barium	ug/L	220	(c)	126	358	NA	NA	400	NA	36.5	40.0
Beryllium	ug/L	3.6	(c)	NA	NA	NA	NA	<0.500	NA	NA	<0.500
Cadmium	ug/L	0.17	(a)	NA	NA	NA	NA	<0.400	NA	NA	<0.400
Calcium	ug/L	--	(j)	10,700	32,800	42,400	41,600	39,000	NA	63,100	452,000
Chromium	ug/L	42	(c)	NA	NA	NA	NA	0.790 J	NA	NA	<0.500
Cobalt	ug/L	24	(c)	NA	1.80	NA	NA	3.00	NA	NA	0.830 J
Copper	ug/L	5.56	(a)	NA	NA	NA	NA	<0.500	NA	4.40	<0.500
Iron	ug/L	--	(j)	12,200	55,400	87,000	85,800	51,400	NA	17.2	13,300
Lead	ug/L	5.4	(d) (e)	NA	NA	NA	NA	2.00	NA	NA	<0.200
Magnesium	ug/L	--	(j)	1,480	4,020	<5,000	<5,000	4,100	NA	14,600	123,000
Manganese	ug/L	120	(i)	209	615	NA	NA	640	NA	19.4	1,100

Appendix A
2014 - 2016 Groundwater Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		SC-01	SC-01	SC-01	SC-01	SC-01	SC-01	SC-02	SC-02
Sample Depth():				--	--	--	--	--	--	--	--
Date Collected:				41887.00	41921.00	42116.00	42116.00	42220.00	42353.00	41897.00	42228.00
Sample Name:	Units	Chronic	Note	SC-1(090514)	SC-1(100914)	DUP-042215	SC-1-042215	SC-1-080415	SC-01-121515	SC-2(091514)	SC-2-081215
Mercury	ug/L	0.77	(d) (e)	NA	NA	NA	NA	<0.150	NA	NA	<0.150
Nickel	ug/L	31.24	(a)	NA	7.00	NA	NA	12.0	NA	2.00	0.670 J
Potassium	ug/L	--	(j)	1,480	2,290	NA	NA	2,200	NA	3,060	6,900
Selenium	ug/L	5	(d)	NA	NA	NA	NA	<0.600	NA	NA	<0.600
Silver	ug/L	0.12	(c)	1.20	NA	NA	NA	<0.500	NA	NA	<0.500
Sodium	ug/L	--	(j)	2,070	3,510	<10,000	<10,000	3,500	NA	7,270	64,100
Thallium	ug/L	10	(c)	NA	NA	NA	NA	<0.200	NA	NA	<0.200
Vanadium	ug/L	12	(c)	NA	NA	NA	NA	<1.30 B	NA	NA	<1.60 B
Zinc	ug/L	71.69	(a)	NA	NA	NA	NA	10.0 J	NA	31.9	<10.0
Miscellaneous											
Alkalinity	ug/L	--		47,200	177,000	NA	NA	217,000	140,000	204,000	208,000
Alkalinity, Bicarbonate	ug/L	--		NA	NA	159,000	165,000	217,000	NA	NA	208,000
Alkalinity, Carbonate	ug/L	--		NA	NA	159,000	165,000	NA	NA	NA	NA
Bromide	ug/L	--		NA	NA	NA	NA	NA	<81	NA	NA
Chloride	ug/L	--		NA	2,400	2,000	2,000	1,450	320	2,800	1,930
Cyanide	ug/L	--		NA	NA	NA	NA	<7	NA	NA	<7
Fluoride, Total	ug/L	--		NA	NA	NA	NA	NA	84	NA	NA
Methane	ug/L	--		NA	NA	NA	NA	NA	44,000	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	<100	<100	NA	670	NA	NA
Nitrate-N	ug/L	--		NA	NA	NA	NA	NA	<21	NA	NA
Nitrite	ug/L	--		NA	NA	<10	<10	NA	670	NA	NA
Sulfate	ug/L	--		NA	NA	<10,000	<10,000	<600	<110	31,300	27,400
Sulfide	ug/L	--		NA	NA	NA	NA	NA	2,500	NA	NA
Total Dissolved Solids	ug/L	--		NA	NA	103,000	160,000	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	NA	NA	NA	830	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	NA	NA	NA	4,100	NA	NA

General Notes:

Results are reported in micrograms per liter (ug/L).
Bolded results indicate concentrations above the detection limit
Shaded cells indicate exceedance of a screening value
Duplicate results are presented in their own column adjacent to the parent sample

Footnotes:

(a) = Criteria can be calculated following formula f3.
(b) = Criteria can be calculated following formula f4.
(c) = U.S. Environmental Protection Agency (USEPA) Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.
(d) = Criterion is expressed as a function of the Water Effects Ratio.
(e) = Dissolved criterion.
(f) = USEPA Ambient Water Quality Criteria Update for Methyl Tertiary-Butyl Ether (MTBE) http://www.epa.gov/waterscience/criteria/mtbe-fs.html
(g) = Metals results are for unfiltered samples
(h) = Value is lowest NOEC reported for growth, survival, or reproduction endpoints from USEPA ECOTOX Database (http://cfpub.epa.gov/ecotox/quick_query.htm), original study Rhodes et. al. 1995.
(i) = Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (USEPA 2006)
(j) = Chemical considered an essential nutrient; therefore a screening level is not necessary
(k) = Michigan Department of Envornmental Quality (MDEQ) Rule 57 Water Quality Values

Acronyms and Abbreviations:

-- = value not available
< = not detected, detection limit presented
B = Indicates an estimated value between the instrument detection limit and the Reporting Limit (RL).
J = estimated result
E = Serial dilution results not within 10%. Applicable only if analyte concentration is at least 50X the IDL in original sample
NA = not analyzed
NJDEP = New Jersey Department of Environmental Protection
R = data rejected

APPENDIX B

2015 Surface Water Analytical Results

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	PMP-POND 04/22/15 PMP-POND-042215	PMP-Pond 08/20/15 PMP-POND-082015	PMP-POND 12/16/15 PMP-POND-121615	SR-03-Pond 08/19/15 SR-3-POND-081915	SR-03-Pond 12/16/15 SR3-POND-121615	SR-03-Seep-1 04/22/15 SR-3-SEEP-1-042215	SR-03-Seep-1 08/19/15 SR-3-SEEP1-081915	SR-03-Seep-1 12/16/15 SR3-SEEP-1-121615
PCBs											
Aroclor-1016	ug/L	--		NA	<0.4	NA	<0.38	NA	NA	<0.43	NA
Aroclor-1221	ug/L	--		NA	<0.31	NA	<0.3	NA	NA	<0.34	NA
Aroclor-1232	ug/L	--		NA	<0.37	NA	<0.36	NA	NA	<0.4	NA
Aroclor-1242	ug/L	--		NA	<0.2	NA	<0.2	NA	NA	<0.22	NA
Aroclor-1248	ug/L	--		NA	<0.14	NA	<0.13	NA	NA	<0.15	NA
Aroclor-1254	ug/L	--		NA	<0.16	NA	<0.15	NA	NA	<0.17	NA
Aroclor-1260	ug/L	--		NA	<0.17	NA	<0.16	NA	NA	<0.18	NA
Total PCBs	ug/L	--		NA	<0.4	NA	<0.38	NA	NA	<0.43	NA
Volatile Organics											
1,1,1-Trichloroethane	ug/L	76	(c)	<0.25	<0.19	<0.28	<0.19	<0.28	<0.25	<0.19	<0.28
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.21	<0.19	<0.19	<0.19	<0.19	<0.21	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.52	<0.15	<0.34	<0.15	<0.34	<0.52	<0.15	<0.34
1,1,2-Trichloroethane	ug/L	500	(c)	<0.21	<0.19	<0.08	<0.19	<0.08	<0.21	<0.19	<0.08
1,1-Dichloroethane	ug/L	--		<0.17	<0.24	<0.24	<0.24	<0.24	<0.17	<0.24	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.51	<0.25	<0.34	<0.25	<0.34	<0.51	<0.25	<0.34
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<1.8	NA	<1.9	NA	NA	<1.9	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.99	<0.01	<0.007	<0.01	<0.007	<0.99	<0.01	<0.007
1,2-Dibromoethane	ug/L	--		<0.23	<0.01	<0.006	<0.01	<0.006	<0.23	<0.01	<0.006
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.19	<0.22	<0.19	<0.22	<0.19	<0.19	<0.22
1,2-Dichloroethane	ug/L	910	(c)	<0.18	<0.2	<0.25	<0.2	<0.25	<0.18	<0.2	<0.25
1,2-Dichloropropane	ug/L	360	(c)	<0.39	<0.25	<0.18	<0.25	<0.18	<0.39	<0.25	<0.18
1,3-Dichlorobenzene	ug/L	38	(c)	<0.23	<0.18	<0.33	<0.18	<0.33	<0.23	<0.18	<0.33
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.27	<0.17	<0.33	<0.17	<0.33	<0.27	<0.17	<0.33
2-Butanone	ug/L	--		<5.6	<2.6	<2.2	<2.6	<2.2	<5.6	<2.6	<2.2
2-Hexanone	ug/L	--		<1.7	<1.3	<0.72	<1.3	<0.72	<1.7	<1.3	<0.72
4-Methyl-2-pentanone	ug/L	--		<1	<0.81	<0.63	<0.81	<0.63	<1	<0.81	<0.63
Acetone	ug/L	--		<3.3	<9 B	<1.1	<2.7	<1.1	<3.3	<2.7	<1.1
Bromochloromethane	ug/L	--		NA	NA	<0.3	NA	<0.3	NA	NA	<0.3
Bromodichloromethane	ug/L	--		<0.23	<0.17	<0.15	<0.17	<0.15	<0.23	<0.17	<0.15
Bromoform	ug/L	230	(c)	<0.23	<0.29	<0.18	<0.29	<0.18	<0.23	<0.29	<0.18
Bromomethane	ug/L	16	(c)	<0.42	<0.35	<0.18	<0.35	<0.18	<0.42	<0.35	<0.18
Carbon Disulfide	ug/L	--		<0.25	<0.22	<0.22	<0.22	<0.22	<0.25	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.22	<0.18	<0.33	<0.18	<0.33	<0.22	<0.18	<0.33
Chlorobenzene	ug/L	47	(c)	<0.19	<0.18	<0.24	<0.18	<0.24	<0.19	<0.18	<0.24
Chloroethane	ug/L	--		<0.34	<0.36	<0.37	<0.36	**2.8**	<0.34	**0.83 J**	**3.6**
Chloroform	ug/L	140	(c)	<0.19	<0.23	<0.22	<0.23	<0.22	<0.19	<0.23	<0.22
Chloromethane	ug/L	--		<0.41	<0.36 J	<0.22	<0.36	<0.22	<0.41	<0.36	<0.22
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.27	<0.21	<0.26	<0.21	**0.4 J**	<0.27	<0.21	**0.78 J**
cis-1,3-Dichloropropene	ug/L	--		<0.21	<0.17	<0.16	<0.17	<0.16	<0.21	<0.17	<0.16
Dibromochloromethane	ug/L	--		<0.15	<0.25	<0.22	<0.25	<0.22	<0.15	<0.25	<0.22
Dichlorodifluoromethane	ug/L	--		<0.9	<0.17	<0.14	<0.17	<0.14	<0.9	<0.17	<0.14
Isopropylbenzene	ug/L	--		<0.23	<0.33	<0.32	<0.33	<0.32	<0.23	<0.33	<0.32

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	PMP-POND 04/22/15 PMP-POND-042215	PMP-Pond 08/20/15 PMP-POND-082015	PMP-POND 12/16/15 PMP-POND-121615	SR-03-Pond 08/19/15 SR-3-POND-081915	SR-03-Pond 12/16/15 SR3-POND-121615	SR-03-Seep-1 04/22/15 SR-3-SEEP-1-042215	SR-03-Seep-1 08/19/15 SR-3-SEEP1-081915	SR-03-Seep-1 12/16/15 SR3-SEEP-1-121615
Methyl acetate	ug/L	--		<1.9	<0.58 J	<0.58	<0.58 J	<0.58	<1.9	<0.58 J	<0.58
Methylcyclohexane	ug/L	--		<0.22	<0.09	<0.22	<0.09	<0.22	<0.22	<0.09	<0.22
Methylene Chloride	ug/L	940	(c)	<0.73	<0.22	<0.21	<0.22	<0.21	<0.73	<0.22	<0.21
Styrene	ug/L	32	(c)	<0.27	<0.28	<0.17	<0.28	<0.17	<0.27	<0.28	<0.17
Tetrachloroethene	ug/L	45	(c)	<0.4	<0.14	<0.12	<0.14	<0.12	<0.4	<0.14	<0.12
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.65	<0.23	<0.18	<0.23	<0.18	<0.65	<0.23	<0.18
trans-1,3-Dichloropropene	ug/L	--		<0.19	<0.17	<0.19	<0.17	<0.19	<0.19	<0.17	<0.19
Trichloroethene	ug/L	47	(c)	<0.22	<0.2	<0.22	<0.2	<0.22	<0.22	<0.2	<0.22
Trichlorofluoromethane	ug/L	--		<0.43	<0.21	<0.15	<0.21	<0.15	<0.43	<0.21	<0.15
Vinyl Chloride	ug/L	930	(c)	<0.15	<0.18	<0.06	<0.18	<0.06	<0.15	<0.18	<0.06
Benzene	ug/L	114	(c)	<0.24	<0.2	<0.09	<0.2	**0.51 J**	<0.24	**0.33 J**	**0.75 J**
Toluene	ug/L	253	(c)	<0.16	<0.17	<0.25	<0.17	<0.25	<0.16	<0.17	<0.25
Ethylbenzene	ug/L	14	(c)	<0.27	<0.19	<0.3	<0.19	<0.3	<0.27	<0.19	<0.3
Xylenes (total)	ug/L	27	(c)	<0.17	<0.58	<0.28	<0.58	**0.35 J**	<0.17	<0.58	**0.55 J**
Methyl tert-butyl ether	ug/L	51000	(f)	<0.24	<0.17	<0.13	<0.17	<0.13	<0.24	<0.17	<0.13
Volatile Organics-TICs											
Total VOC TICs	ug/L	--		0 JN	NA	NA	NA	NA	0 JN	NA	NA
Semivolatile Organics											
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	<0.35	NA	<0.35	NA	NA	<0.35
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	NA	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.21	<0.2	<0.27	<0.2	<0.27	<0.21	<0.2	<0.27
1,4-Dioxane	ug/L	22000	(k)	NA	<0.27	<0.059	**1.6 J**	**1.9**	NA	**2 J**	**2.16**
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.4	NA	<2.5	NA	NA	<2.5	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<5.9	NA	<6.2	NA	NA	<6.2	NA
2,4,5-Trichlorophenol	ug/L	--		NA	<6.1	NA	<6.3	NA	NA	<6.3	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<5.9	NA	<6.1	NA	NA	<6.1	NA
2,4-Dichlorophenol	ug/L	11	(c)	NA	<4.8	NA	<5	NA	NA	<5	NA
2,4-Dimethylphenol	ug/L	100	(c)	NA	<3.6	NA	<3.8	NA	NA	<3.8	NA
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.1	NA	<5.3	NA	NA	<5.3	NA
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<2.8	NA	<2.9	NA	NA	<2.9	NA
2,6-Dinitrotoluene	ug/L	--		NA	<2	NA	<2.1	NA	NA	<2.1	NA
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.4	NA	<2.5	NA	NA	<2.5	NA
2-Chlorophenol	ug/L	24	(c)	NA	<4.1	NA	<4.3	NA	NA	<4.3	NA
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.34	NA	<0.36	NA	NA	<0.36	NA
2-Methylphenol	ug/L	--		NA	<2	NA	<2.1	NA	NA	<2.1	NA
2-Nitroaniline	ug/L	--		NA	<3.2	NA	<3.3	NA	NA	<3.3	NA
2-Nitrophenol	ug/L	--		NA	<4.6	NA	<4.7	NA	NA	<4.7	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<2.8	NA	<2.9	NA	NA	<2.9	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<1.9	NA	<2	NA	NA	<2	NA
3-Nitroaniline	ug/L	--		NA	<2.3	NA	<2.4	NA	NA	<2.4	NA
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<8	NA	<8.3	NA	NA	<8.3	NA
4-Bromophenyl-phenylether	ug/L	--		NA	<2.3	NA	<2.4	NA	NA	<2.4	NA
4-Chloro-3-Methylphenol	ug/L	--		NA	<3.9	NA	<4	NA	NA	<4	NA

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	PMP-POND 04/22/15 PMP-POND-042215	PMP-Pond 08/20/15 PMP-POND-082015	PMP-POND 12/16/15 PMP-POND-121615	SR-03-Pond 08/19/15 SR-3-POND-081915	SR-03-Pond 12/16/15 SR3-POND-121615	SR-03-Seep-1 04/22/15 SR-3-SEEP-1-042215	SR-03-Seep-1 08/19/15 SR-3-SEEP1-081915	SR-03-Seep-1 12/16/15 SR3-SEEP-1-121615
4-Chloroaniline	ug/L	--		NA	<3.6	NA	<3.8	NA	NA	<3.8	NA
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.4	NA	<2.5	NA	NA	<2.5	NA
4-Nitroaniline	ug/L	--		NA	<2.7	NA	<2.8	NA	NA	<2.8	NA
4-Nitrophenol	ug/L	60	(c)	NA	<4.7	NA	<4.8	NA	NA	<4.8	NA
Acenaphthene	ug/L	38	(c)	NA	<0.28	NA	<0.29	NA	NA	<0.29	NA
Acenaphthylene	ug/L	4840	(c)	NA	<0.3	NA	<0.31	NA	NA	<0.31	NA
Acetophenone	ug/L	--		NA	<2	NA	<2.1	NA	NA	<2.1	NA
Anthracene	ug/L	0.035	(c)	NA	<0.33	NA	<0.34	NA	NA	<0.34	NA
Atrazine	ug/L	--		NA	<2.5	NA	<2.6	NA	NA	<2.6	NA
Benzaldehyde	ug/L	--		NA	<4.9	NA	<5.1	NA	NA	<5.1	NA
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	<0.022	NA	NA	<0.023	NA
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	<0.022	NA	NA	<0.023	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	<0.022	NA	NA	<0.023	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.53	NA	<0.55	NA	NA	<0.55	NA
Benzo(k)fluoranthene	ug/L	--		NA	<0.32	NA	<0.33	NA	NA	<0.33	NA
bis(2-Chloroethoxy)methane	ug/L	--		NA	<2.7	NA	<2.8	NA	NA	<2.8	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.4	NA	<2.5	NA	NA	<2.5	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<5.2	NA	<5.4	NA	NA	<5.4	NA
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.2	NA	<2.2	NA	NA	<2.2	NA
Caprolactam	ug/L	--		NA	<2.1	NA	<2.1	NA	NA	<2.1	NA
Carbazole	ug/L	--		NA	<2.4	NA	<2.5	NA	NA	<2.5	NA
Chrysene	ug/L	--		NA	<0.28	NA	<0.29	NA	NA	<0.29	NA
Cyclohexane	ug/L	--		<0.28	<0.13	<0.26	<0.13	<0.26	<0.28	<0.13	<0.26
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.39	NA	<0.4	NA	NA	<0.4	NA
Dibenzofuran	ug/L	--		NA	<2.5	NA	<2.6	NA	NA	<2.6	NA
Diethylphthalate	ug/L	110	(c)	NA	<2.6	NA	<2.7	NA	NA	<2.7	NA
Dimethylphthalate	ug/L	--		NA	<2.7	NA	<2.8	NA	NA	<2.8	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.2	NA	<2.2	NA	NA	<2.2	NA
Di-n-Octylphthalate	ug/L	--		NA	<2.2	NA	<2.2	NA	NA	<2.2	NA
Diphenyl ether	ug/L	--		NA	<1.9	NA	<2	NA	NA	<2	NA
Fluoranthene	ug/L	1.9	(c)	NA	<0.28	NA	<0.29	NA	NA	<0.29	NA
Fluorene	ug/L	19	(c)	NA	<0.28	NA	<0.29	NA	NA	<0.29	NA
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	<0.012	NA	NA	<0.013	NA
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	<0.18	NA	NA	<0.18	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.6	NA	<1.6	NA	NA	<1.6	NA
Hexachloroethane	ug/L	8	(c)	NA	<1.6	NA	<1.7	NA	NA	<1.7	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.35	NA	<0.37	NA	NA	<0.37	NA
Isophorone	ug/L	920	(c)	NA	<2.7	NA	<2.8	NA	NA	<2.8	NA
Naphthalene	ug/L	13	(c)	NA	<0.32	NA	<0.33	NA	NA	<0.33	NA
Nitrobenzene	ug/L	220	(c)	NA	<2.3	NA	<2.4	NA	NA	<2.4	NA
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	<0.18	NA	NA	<0.18	NA
N-Nitroso-di-n-propylamine	ug/L	--		NA	<2.9	NA	<3	NA	NA	<3	NA
N-Nitrosodiphenylamine	ug/L	--		NA	<3.1	NA	<3.2	NA	NA	<3.2	NA

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Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	 Notes	PMP-POND 04/22/15 PMP-POND-042215	PMP-Pond 08/20/15 PMP-POND-082015	PMP-POND 12/16/15 PMP-POND-121615	SR-03-Pond 08/19/15 SR-3-POND-081915	SR-03-Pond 12/16/15 SR3-POND-121615	SR-03-Seep-1 04/22/15 SR-3-SEEP-1-042215	SR-03-Seep-1 08/19/15 SR-3-SEEP1-081915	SR-03-Seep-1 12/16/15 SR3-SEEP-1-121615
Pentachlorophenol	ug/L	--		NA	<0.1	NA	<0.088	NA	NA	<0.091	NA
Phenanthrene	ug/L	3.6	(c)	NA	<0.36	NA	<0.38	NA	NA	<0.38	NA
Phenol	ug/L	180	(c)	NA	<1.3	NA	<1.3	NA	NA	<1.3	NA
Pyrene	ug/L	0.3	(c)	NA	<0.3	NA	<0.31	NA	NA	<0.31	NA
Semivolatile Organics-TICs											
[1,1'-Biphenyl]-4,4'-diamine, N,N,N',N'-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, diisooctyl-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
2,6,10,14,18,22-Tetracosahexaene, 2,6,10	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
9-Octadecenoic acid, (E)-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Acetic acid, chloro-, octadecyl ester	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Cholestan-3-ol, 4-methyl-, (3.beta.,4.alpha)-	ug/L	--		NA	3.7 JN	NA	NA	NA	NA	NA	NA
Diethylene glycol dibenzoate	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Heptadecane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Hexadecanoic Acid	ug/L	--		NA	NA	NA	NA	NA	NA	**4 JN**	NA
N,N-Diethyl-3-Methylbenzamide	ug/L	--		NA	NA	NA	**3.3 JN**	NA	NA	NA	NA
Octadecanoic Acid	ug/L	--		NA	NA	NA	**5.3 JN**	NA	NA	**3.5 JN**	NA
Octaethylene glycol monododecyl ether	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Oleic Acid	ug/L	--		NA	**5 JN**	NA	NA	NA	NA	NA	NA
Oxirane, heptadecyl-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA
Tetradecanoic acid	ug/L	--		NA	**4.2 JN**	NA	NA	NA	NA	NA	NA
Total Alkanes	ug/L	--		0 JN	NA	NA	NA	NA	0 JN	NA	NA
Tridecanoic acid	ug/L	--		NA	NA	NA	**5.8 JN**	NA	NA	NA	NA
Inorganics											
Aluminum	ug/L	87	(i)	NA	**28**	NA	<9.6	NA	NA	**600**	NA
Antimony	ug/L	80	(c)	NA	<0.5	NA	<0.5	NA	NA	**1.3 J**	NA
Arsenic	ug/L	150	(d) (e)	NA	<0.5	NA	<1.8 B	NA	NA	**4.7 B**	NA
Barium	ug/L	220	(c)	NA	**86**	NA	**75**	NA	NA	**270**	NA
Beryllium	ug/L	3.6	(c)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Cadmium	ug/L	0.17	(a)	NA	<0.4	NA	<0.4	NA	NA	<0.4	NA
Calcium	ug/L	--	(j)	NA	**20,500**	NA	**27,600**	NA	NA	**26,100**	NA
Chromium	ug/L	42	(c)	NA	<0.5	NA	<0.5	NA	NA	**2.7**	NA
Cobalt	ug/L	24	(c)	NA	<0.5	NA	<0.5	NA	NA	**3.4**	NA
Copper	ug/L	5.56	(a)	NA	<0.5	NA	<0.5	NA	NA	**6.1**	NA
Iron	ug/L	--	(j)	NA	**3,800**	NA	**540**	NA	NA	**74,400**	NA
Lead	ug/L	5.4	(d) (e)	NA	**0.58 J**	NA	**0.28 J**	NA	NA	**4.3**	NA
Magnesium	ug/L	--	(j)	NA	**3,500**	NA	**4,500**	NA	NA	**4,000**	NA
Manganese	ug/L	120	(i)	NA	**97**	**152**	**52**	**793**	NA	**1,100**	**560**
Mercury	ug/L	0.77	(d) (e)	NA	<0.15	NA	<0.15	NA	NA	<0.15	NA
Nickel	ug/L	31.24	(a)	NA	<0.5	NA	**0.71 J**	NA	NA	**4.6**	NA
Potassium	ug/L	--	(j)	NA	**5,700**	NA	**1,700**	NA	NA	**1,600**	NA
Selenium	ug/L	5	(d)	NA	<0.6	NA	<0.6	NA	NA	<0.98 B	NA
Silver	ug/L	0.12	(c)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Sodium	ug/L	--	(j)	NA	**2,400**	NA	**6,300**	NA	NA	**3,500**	NA

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	PMP-POND 04/22/15 PMP-POND-042215	PMP-Pond 08/20/15 PMP-POND-082015	PMP-POND 12/16/15 PMP-POND-121615	SR-03-Pond 08/19/15 SR-3-POND-081915	SR-03-Pond 12/16/15 SR3-POND-121615	SR-03-Seep-1 04/22/15 SR-3-SEEP-1-042215	SR-03-Seep-1 08/19/15 SR-3-SEEP1-081915	SR-03-Seep-1 12/16/15 SR3-SEEP-1-121615
Thallium	ug/L	10	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
Vanadium	ug/L	12	(c)	NA	<1.5 B	NA	<0.93 B	NA	NA	**4.8 B**	NA
Zinc	ug/L	71.69	(a)	NA	<10	NA	<10	NA	NA	**39**	NA
Inorganics-Filtered											
Aluminum	ug/L	87	(i)	NA	<9.6	NA	<9.6	NA	NA	<9.6	NA
Antimony	ug/L	80	(c)	NA	**1.6 J**	NA	<0.5	NA	NA	<0.5	NA
Arsenic	ug/L	150	(d) (e)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Barium	ug/L	220	(c)	NA	**86**	NA	**71**	NA	NA	**150**	NA
Beryllium	ug/L	3.6	(c)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Cadmium	ug/L	0.17	(a)	NA	<0.4	NA	<0.4	NA	NA	<0.4	NA
Calcium	ug/L	--	(j)	NA	**19,000**	NA	**26,500**	NA	NA	**23,500**	NA
Chromium	ug/L	42	(c)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Cobalt	ug/L	24	(c)	NA	<0.5	NA	<0.5	NA	NA	**1.2 J**	NA
Copper	ug/L	5.56	(a)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Iron	ug/L	--	(j)	NA	**700**	NA	**62**	NA	NA	<10	NA
Lead	ug/L	5.4	(d) (e)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
Magnesium	ug/L	--	(j)	NA	**3,300**	NA	**4,400**	NA	NA	**3,700**	NA
Manganese	ug/L	120	(i)	NA	**56**	NA	**20**	NA	NA	**840**	NA
Mercury	ug/L	0.77	(d) (e)	NA	<0.15	NA	<0.15	NA	NA	<0.15	NA
Nickel	ug/L	31.24	(a)	NA	**0.89 J**	NA	<0.5	NA	NA	**0.92 J**	NA
Potassium	ug/L	--	(j)	NA	**5,200**	NA	**1,600**	NA	NA	**1,300**	NA
Selenium	ug/L	5	(d)	NA	<0.6	NA	<0.6	NA	NA	<0.6	NA
Silver	ug/L	0.12	(c)	NA	<0.5	NA	<0.5	NA	NA	<0.5	NA
Sodium	ug/L	--	(j)	NA	**2,300**	NA	**10,900**	NA	NA	**3,400**	NA
Thallium	ug/L	10	(c)	NA	<0.2	NA	<0.2	NA	NA	<0.2	NA
Vanadium	ug/L	12	(c)	NA	<1.1 B	NA	<1 B	NA	NA	<0.95 B	NA
Zinc	ug/L	71.69	(a)	NA	<10	NA	<10	NA	NA	<10	NA
Miscellaneous											
Alkalinity	ug/L	--		NA	**74,900**	**82,100**	**79,400**	**72,100**	NA	**82,500**	**106,000**
Alkalinity, Bicarbonate	ug/L	--		NA	**74,900**	NA	**79,400**	NA	NA	**82,500**	NA
Bromide	ug/L	--		NA	NA	<81	NA	<81	NA	NA	<81
Chloride	ug/L	--		NA	**1,610**	**1,680 J**	**4,200**	**1,950**	NA	**1,580**	**2,420**
Cyanide	ug/L	--		NA	<7	NA	<7	NA	NA	<7	NA
Fluoride, Total	ug/L	--		NA	NA	**52 J**	NA	**53 J**	NA	NA	**63 J**
Methane	ug/L	--		NA	NA	**1,200**	NA	**820**	NA	NA	**1,300**
Nitrate and Nitrite	ug/L	--		NA	NA	<21	NA	**25 J**	NA	NA	<21
Nitrate-N	ug/L	--		NA	NA	<21	NA	<21	NA	NA	<21
Nitrite	ug/L	--		NA	NA	<29	NA	<29	NA	NA	<29
Sulfate	ug/L	--		NA	<600	<110	**1,120**	**3,570**	NA	**950 J**	**4,070**
Sulfide	ug/L	--		NA	NA	<820	NA	<820	NA	NA	<820
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	<140	NA	<140	NA	NA	**250**
Total Organic Carbon	ug/L	--		NA	NA	**4,300**	NA	**1,800**	NA	NA	**4,300**

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		SR-03-Seep-2	SR-03-Seep-2	SW-11	SW-MRB-01	SW-MRB-02	SW-MRB-03	SW-PAB-01	SW-PAB-01	SW-PAB-01
Date Collected:				08/19/15	12/16/15	08/21/15	08/20/15	08/20/15	08/20/15	04/22/15	08/21/15	12/16/15
Sample Name:	Units	Chronic	Notes	SR-3-SEEP2-081915	SR3-SEEP-2-121615	SW-11-082115	SW-MRB-01-082015	SW-MRB-02-082015	SW-MRB-03-082015	SW-PAB-01-042215	SW-PAB-01-082115	SW-PAB-01-121615
PCBs												
Aroclor-1016	ug/L	--		<0.43	NA	<0.37	<0.4	<0.4	<0.43	NA	<0.37	NA
Aroclor-1221	ug/L	--		<0.34	NA	<0.29	<0.31	<0.31	<0.34	NA	<0.29	NA
Aroclor-1232	ug/L	--		<0.4	NA	<0.34	<0.37	<0.37	<0.4	NA	<0.34	NA
Aroclor-1242	ug/L	--		<0.22	NA	<0.19	<0.2	<0.2	<0.22	NA	<0.19	NA
Aroclor-1248	ug/L	--		<0.15	NA	<0.13	<0.14	<0.14	<0.15	NA	<0.13	NA
Aroclor-1254	ug/L	--		<0.17	NA	<0.15	<0.16	<0.16	<0.17	NA	<0.15	NA
Aroclor-1260	ug/L	--		<0.18	NA	<0.16	<0.17	<0.17	<0.18	NA	<0.16	NA
Total PCBs	ug/L	--		<0.43	NA	<0.37	<0.4	<0.4	<0.43	NA	<0.37	NA
Volatile Organics												
1,1,1-Trichloroethane	ug/L	76	(c)	<0.19	<0.28	<0.19	<0.19	<0.19	<0.19	<0.25	<0.19	<0.28
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.21	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.15	<0.34	<0.15	<0.15	<0.15	<0.15	<0.52	<0.15	<0.34
1,1,2-Trichloroethane	ug/L	500	(c)	<0.19	<0.08	<0.19	<0.19	<0.19	<0.19	<0.21	<0.19	<0.08
1,1-Dichloroethane	ug/L	--		<0.24	**1.4**	<0.24	<0.24	<0.24	<0.24	<0.17	<0.24	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.25	<0.34	<0.25	<0.25	<0.25	<0.25	<0.51	<0.25	<0.34
1,2,4,5-Tetrachlorobenzene	ug/L	--		<1.9	NA	<1.9	<1.9	<1.8	<1.8	NA	<1.8	NA
1,2-Dibromo-3-chloropropane	ug/L	--		<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.99	<0.01	<0.007
1,2-Dibromoethane	ug/L	--		<0.01	<0.006	<0.01	<0.01	<0.01	<0.01	<0.23	<0.01	<0.006
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.22	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.22
1,2-Dichloroethane	ug/L	910	(c)	<0.2	<0.25	<0.2	<0.2	<0.2	<0.2	<0.18	<0.2	<0.25
1,2-Dichloropropane	ug/L	360	(c)	<0.25	<0.18	<0.25	<0.25	<0.25	<0.25	<0.39	<0.25	<0.18
1,3-Dichlorobenzene	ug/L	38	(c)	<0.18	<0.33	<0.18	<0.18	<0.18	<0.18	<0.23	<0.18	<0.33
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.17	<0.33	<0.17	<0.17	<0.17	<0.17	<0.27	<0.17	<0.33
2-Butanone	ug/L	--		<2.6	<2.2	<2.6	<2.6	<2.6	<2.6	<5.6	<2.6	<2.2
2-Hexanone	ug/L	--		<1.3	<0.72	<1.3	<1.3	<1.3	<1.3	<1.7	<1.3	<0.72
4-Methyl-2-pentanone	ug/L	--		<0.81	<0.63	<0.81	<0.81	<0.81	<0.81	<1	<0.81	<0.63
Acetone	ug/L	--		<2.7	<1.1	<2.7 J	<2.7 J	<2.7 J	<2.7 J	<3.3	<2.7 J	<1.1
Bromochloromethane	ug/L	--		NA	<0.3	NA	NA	NA	NA	NA	NA	<0.3
Bromodichloromethane	ug/L	--		<0.17	<0.15	<0.17	<0.17	<0.17	<0.17	<0.23	<0.17	<0.15
Bromoform	ug/L	230	(c)	<0.29	<0.18	<0.29	<0.29	<0.29	<0.29	<0.23	<0.29	<0.18
Bromomethane	ug/L	16	(c)	<0.35	<0.18	<0.35 J	<0.35 J	<0.35 J	<0.35 J	<0.42	<0.35 J	<0.18
Carbon Disulfide	ug/L	--		<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.25	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.18	<0.33	<0.18	<0.18	<0.18	<0.18	<0.22	<0.18	<0.33
Chlorobenzene	ug/L	47	(c)	<0.18	<0.24	<0.18	<0.18	<0.18	<0.18	<0.19	<0.18	<0.24
Chloroethane	ug/L	--		**1.8**	**11**	<0.36	<0.36	<0.36	<0.36	<0.34	<0.36	**1.2**
Chloroform	ug/L	140	(c)	<0.23	<0.22	<0.23	<0.23	<0.23	<0.23	<0.19	<0.23	<0.22
Chloromethane	ug/L	--		<0.36	**0.6 J**	<0.36 J	<0.36 J	<0.36 J	<0.36 J	<0.41	<0.36 J	<0.22
cis-1,2-Dichloroethene	ug/L	590	(i)	**0.26 J**	**1.9**	<0.21	<0.21	<0.21	<0.21	<0.27	<0.21	<0.26
cis-1,3-Dichloropropene	ug/L	--		<0.17	<0.16	<0.17	<0.17	<0.17	<0.17	<0.21	<0.17	<0.16
Dibromochloromethane	ug/L	--		<0.25	<0.22	<0.25	<0.25	<0.25	<0.25	<0.15	<0.25	<0.22
Dichlorodifluoromethane	ug/L	--		<0.17	<0.14	<0.17	<0.17	<0.17	<0.17	<0.9	<0.17	<0.14
Isopropylbenzene	ug/L	--		<0.33	**0.38 J**	<0.33	<0.33	<0.33	<0.33	<0.23	<0.33	<0.32

Appendix B
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Site-Related Groundwater Ecological Assessment
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Location ID:		Ecologically Based Screening Levels (EBSLs)		SR-03-Seep-2	SR-03-Seep-2	SW-11	SW-MRB-01	SW-MRB-02	SW-MRB-03	SW-PAB-01	SW-PAB-01	SW-PAB-01
Date Collected:				08/19/15	12/16/15	08/21/15	08/20/15	08/20/15	08/20/15	04/22/15	08/21/15	12/16/15
Sample Name:	Units	Chronic	Notes	SR-3-SEEP2-081915	SR3-SEEP-2-121615	SW-11-082115	SW-MRB-01-082015	SW-MRB-02-082015	SW-MRB-03-082015	SW-PAB-01-042215	SW-PAB-01-082115	SW-PAB-01-121615
Methyl acetate	ug/L	--		<0.58 J	<0.58	<0.58 J	<0.58 J	<0.58 J	<0.58 J	<1.9	<0.58 J	<0.58
Methylcyclohexane	ug/L	--		<0.09	<0.22	<0.09	<0.09	<0.09	<0.09	<0.22	<0.09	<0.22
Methylene Chloride	ug/L	940	(c)	<0.22	<0.21	<0.22	<0.22	<0.22	<0.22	<0.73	<0.22	<0.21
Styrene	ug/L	32	(c)	<0.28	<0.17	<0.28	<0.28	<0.28	<0.28	<0.27	<0.28	<0.17
Tetrachloroethene	ug/L	45	(c)	<0.14	<0.12	<0.14	<0.14	<0.14	<0.14	<0.4	<0.14	<0.12
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.23	<0.18	<0.23	<0.23	<0.23	<0.23	<0.65	<0.23	<0.18
trans-1,3-Dichloropropene	ug/L	--		<0.17	<0.19	<0.17	<0.17	<0.17	<0.17	<0.19	<0.17	<0.19
Trichloroethene	ug/L	47	(c)	<0.2	<0.22	<0.2	<0.2	<0.2	<0.2	<0.22	<0.2	<0.22
Trichlorofluoromethane	ug/L	--		<0.21	<0.15	<0.21	<0.21	<0.21	<0.21	<0.43	<0.21	<0.15
Vinyl Chloride	ug/L	930	(c)	<0.18	**0.47 J**	<0.18	<0.18	<0.18	<0.18	<0.15	<0.18	<0.06
Benzene	ug/L	114	(c)	**0.67 J**	**2.4**	<0.2	<0.2	<0.2	<0.2	<0.24	<0.2	**0.33 J**
Toluene	ug/L	253	(c)	<0.17	<0.25	<0.17	<0.17	**0.33 J**	<0.17	<0.16	<0.17	<0.25
Ethylbenzene	ug/L	14	(c)	<0.19	<0.3	<0.19	<0.19	<0.19	<0.19	<0.27	<0.19	<0.3
Xylenes (total)	ug/L	27	(c)	<0.58	**2.8**	<0.58	<0.58	<0.58	<0.58	<0.17	<0.58	<0.28
Methyl tert-butyl ether	ug/L	51000	(f)	<0.17	<0.13	<0.17	<0.17	<0.17	<0.17	<0.24	<0.17	<0.13
Volatile Organics-TICs												
Total VOC TICs	ug/L	--		NA	NA	NA	NA	NA	NA	0 JN	NA	NA
Semivolatile Organics												
1,2,3-Trichlorobenzene	ug/L	--		NA	<0.35	NA	NA	NA	NA	NA	NA	<0.35
1,2,3-Trichloropropane	ug/L	--		<0.01	NA	<0.01	<0.01	<0.01	<0.01	NA	<0.01	NA
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.2	<0.27	<0.2	<0.2	<0.2	<0.2	<0.21	<0.2	<0.27
1,4-Dioxane	ug/L	22000	(k)	**1.3 J**	**3.56**	<0.27	<0.27	<0.27	<0.27	NA	<0.27	**0.813**
2,2'-Oxybis(1-Chloropropane)	ug/L	--		<2.5	NA	<2.5	<2.5	<2.5	<2.5	NA	<2.5	NA
2,3,4,6-Tetrachlorophenol	ug/L	--		<6.2	NA	<6.3	<6.2	<6.1	<6.1	NA	<6.1	NA
2,4,5-Trichlorophenol	ug/L	--		<6.3	NA	<6.5	<6.3	<6.2	<6.2	NA	<6.2	NA
2,4,6-Trichlorophenol	ug/L	4.9	(c)	<6.1	NA	<6.2	<6.1	<6	<6	NA	<6	NA
2,4-Dichlorophenol	ug/L	11	(c)	<5	NA	<5.1	<5	<4.9	<4.9	NA	<4.9	NA
2,4-Dimethylphenol	ug/L	100	(c)	<3.8	NA	<3.8	<3.8	<3.7	<3.7	NA	<3.7	NA
2,4-Dinitrophenol	ug/L	19	(c)	<5.3	NA	<5.4	<5.3	<5.2	<5.2	NA	<5.2	NA
2,4-Dinitrotoluene	ug/L	44	(c)	<2.9	NA	<2.9	<2.9	<2.8	<2.8	NA	<2.8	NA
2,6-Dinitrotoluene	ug/L	--		<2.1	NA	<2.1	<2.1	<2	<2	NA	<2	NA
2-Chloronaphthalene	ug/L	0.396	(c)	<2.5	NA	<2.5	<2.5	<2.5	<2.5	NA	<2.5	NA
2-Chlorophenol	ug/L	24	(c)	<4.3	NA	<4.4	<4.3	<4.2	<4.2	NA	<4.2	NA
2-Methylnaphthalene	ug/L	330	(c)	<0.36	NA	<0.36	<0.36	<0.35	<0.35	NA	<0.35	NA
2-Methylphenol	ug/L	--		<2.1	NA	<2.1	<2.1	<2	<2	NA	<2	NA
2-Nitroaniline	ug/L	--		<3.3	NA	<3.4	<3.3	<3.2	<3.2	NA	<3.2	NA
2-Nitrophenol	ug/L	--		<4.7	NA	<4.8	<4.7	<4.6	<4.6	NA	<4.6	NA
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	<2.9	NA	<3	<2.9	<2.9	<2.9	NA	<2.9	NA
3-Methylphenol, 4-Methylphenol	ug/L	--		<2	NA	<2	<2	<1.9	<1.9	NA	<1.9	NA
3-Nitroaniline	ug/L	--		<2.4	NA	<2.5	<2.4	<2.4	<2.4	NA	<2.4	NA
4,6-Dinitro-2-methylphenol	ug/L	--		<8.3	NA	<8.5	<8.3	<8.2	<8.2	NA	<8.2	NA
4-Bromophenyl-phenylether	ug/L	--		<2.4	NA	<2.5	<2.4	<2.4	<2.4	NA	<2.4	NA
4-Chloro-3-Methylphenol	ug/L	--		<4	NA	<4.1	<4	<3.9	<3.9	NA	<3.9	NA

ED_001829_00000091-00182

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Date Collected: Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	SR-03-Seep-2 08/19/15 SR-3-SEEP2-081915	SR-03-Seep-2 12/16/15 SR3-SEEP-2-121615	SW-11 08/21/15 SW-11-082115	SW-MRB-01 08/20/15 SW-MRB-01-082015	SW-MRB-02 08/20/15 SW-MRB-02-082015	SW-MRB-03 08/20/15 SW-MRB-03-082015	SW-PAB-01 04/22/15 SW-PAB-01-042215	SW-PAB-01 08/21/15 SW-PAB-01-082115	SW-PAB-01 12/16/15 SW-PAB-01-121615
4-Chloroaniline	ug/L	--		<3.8	NA	<3.8	<3.8	<3.7	<3.7	NA	<3.7	NA
4-Chlorophenyl-phenylether	ug/L	--		<2.5	NA	<2.5	<2.5	<2.5	<2.5	NA	<2.5	NA
4-Nitroaniline	ug/L	--		<2.8	NA	<2.8	<2.8	<2.7	<2.7	NA	<2.7	NA
4-Nitrophenol	ug/L	60	(c)	<4.8	NA	<4.9	<4.8	<4.7	<4.7	NA	<4.7	NA
Acenaphthene	ug/L	38	(c)	<0.29	NA	<0.29	<0.29	<0.28	<0.28	NA	<0.28	NA
Acenaphthylene	ug/L	4840	(c)	<0.31	NA	<0.32	<0.31	<0.31	<0.31	NA	<0.31	NA
Acetophenone	ug/L	--		<2.1	NA	<2.1	<2.1	<2	<2	NA	<2	NA
Anthracene	ug/L	0.035	(c)	<0.34	NA	<0.35	<0.34	<0.33	<0.33	NA	<0.33	NA
Atrazine	ug/L	--		<2.6	NA	<2.6	<2.6	<2.5	<2.5	NA	<2.5	NA
Benzaldehyde	ug/L	--		<5.1	NA	<5.2	<5.1	<5	<5	NA	<5	NA
Benzo(a)anthracene	ug/L	0.025	(c)	<0.024	NA	R	<0.025	<0.025	<0.025	NA	<0.025	NA
Benzo(a)pyrene	ug/L	0.014	(c)	<0.024	NA	R	<0.025	<0.025	<0.025	NA	<0.025	NA
Benzo(b)fluoranthene	ug/L	9.07	(c)	<0.024	NA	R	<0.025	<0.025	<0.025	NA	<0.025	NA
Benzo(g,h,i)perylene	ug/L	7.64	(c)	<0.55	NA	<0.56	<0.55	<0.54	<0.54	NA	<0.54	NA
Benzo(k)fluoranthene	ug/L	--		<0.33	NA	<0.34	<0.33	<0.32	<0.32	NA	<0.32	NA
bis(2-Chloroethoxy)methane	ug/L	--		<2.8	NA	<2.8	<2.8	<2.7	<2.7	NA	<2.7	NA
bis(2-Chloroethyl)ether	ug/L	1900	(c)	<2.5	NA	<2.5	<2.5	<2.5	<2.5	NA	<2.5	NA
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	<5.4	NA	<5.5	<5.4	<5.3	<5.3	NA	<5.3	NA
Butylbenzylphthalate	ug/L	23	(c)	<2.2	NA	<2.3	<2.2	<2.2	<2.2	NA	<2.2	NA
Caprolactam	ug/L	--		<2.1	NA	<2.2	<2.1	<2.1	<2.1	NA	<2.1	NA
Carbazole	ug/L	--		<2.5	NA	<2.5	<2.5	<2.5	<2.5	NA	<2.5	NA
Chrysene	ug/L	--		<0.29	NA	<0.3	<0.29	<0.29	<0.29	NA	<0.29	NA
Cyclohexane	ug/L	--		<0.13	<0.26	<0.13	<0.13	<0.13	<0.13	<0.28	<0.13	<0.26
Dibenzo(a,h)anthracene	ug/L	--		<0.4	NA	<0.41	<0.4	<0.39	<0.39	NA	<0.39	NA
Dibenzofuran	ug/L	--		<2.6	NA	<2.6	<2.6	<2.5	<2.5	NA	<2.5	NA
Diethylphthalate	ug/L	110	(c)	<2.7	NA	<2.7	<2.7	<2.6	<2.6	NA	<2.6	NA
Dimethylphthalate	ug/L	--		<2.8	NA	<2.8	<2.8	<2.7	<2.7	NA	<2.7	NA
Di-n-Butylphthalate	ug/L	9.7	(c)	<2.2	NA	<2.3	<2.2	<2.2	<2.2	NA	<2.2	NA
Di-n-Octylphthalate	ug/L	--		<2.2	NA	<2.3	<2.2	<2.2	<2.2	NA	<2.2	NA
Diphenyl ether	ug/L	--		<2	NA	<2	<2	<1.9	<1.9	NA	<1.9	NA
Fluoranthene	ug/L	1.9	(c)	<0.29	NA	<0.29	<0.29	<0.28	<0.28	NA	<0.28	NA
Fluorene	ug/L	19	(c)	<0.29	NA	<0.29	<0.29	<0.28	<0.28	NA	<0.28	NA
Hexachlorobenzene	ug/L	0.0003	(c)	<0.013	NA	R	<0.014	<0.014	<0.014	NA	<0.014	NA
Hexachlorobutadiene	ug/L	0.053	(c)	<0.19	NA	R	<0.2	<0.2	<0.2	NA	<0.2	NA
Hexachlorocyclopentadiene	ug/L	77	(c)	<1.6	NA	<1.6	<1.6	<1.6	<1.6	NA	<1.6	NA
Hexachloroethane	ug/L	8	(c)	<1.7	NA	<1.7	<1.7	<1.7	<1.7	NA	<1.7	NA
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	<0.37	NA	<0.37	<0.37	<0.36	<0.36	NA	<0.36	NA
Isophorone	ug/L	920	(c)	<2.8	NA	<2.8	<2.8	<2.7	<2.7	NA	<2.7	NA
Naphthalene	ug/L	13	(c)	<0.33	NA	<0.34	<0.33	<0.32	<0.32	NA	<0.32	NA
Nitrobenzene	ug/L	220	(c)	<2.4	NA	<2.5	<2.4	<2.4	<2.4	NA	<2.4	NA
N-Nitrosodimethylamine	ug/L	--		<0.19	NA	R	<0.2	<0.2	<0.2	NA	<0.2	NA
N-Nitroso-di-n-propylamine	ug/L	--		<3	NA	<3.1	<3	<3	<3	NA	<3	NA
N-Nitrosodiphenylamine	ug/L	--		<3.2	NA	<3.3	<3.2	<3.2	<3.2	NA	<3.2	NA

Location ID:		Ecologically Based Screening Levels (EBSLs)		SR-03-Seep-2	SR-03-Seep-2	SW-11	SW-MRB-01	SW-MRB-02	SW-MRB-03	SW-PAB-01	SW-PAB-01	SW-PAB-01
Date Collected:				08/19/15	12/16/15	08/21/15	08/20/15	08/20/15	08/20/15	04/22/15	08/21/15	12/16/15
Sample Name:	Units	Chronic	Notes	SR-3-SEEP2-081915	SR3-SEEP-2-121615	SW-11-082115	SW-MRB-01-082015	SW-MRB-02-082015	SW-MRB-03-082015	SW-PAB-01-042215	SW-PAB-01-082115	SW-PAB-01-121615
Pentachlorophenol	ug/L	--		<0.094	NA	**0.11 J**	<0.1	<0.1	<0.1	NA	R	NA
Phenanthrene	ug/L	3.6	(c)	<0.38	NA	<0.38	<0.38	<0.37	<0.37	NA	<0.37	NA
Phenol	ug/L	180	(c)	<1.3	NA	<1.4	<1.3	<1.3	<1.3	NA	<1.3	NA
Pyrene	ug/L	0.3	(c)	<0.31	NA	<0.32	<0.31	<0.31	<0.31	NA	<0.31	NA
Semivolatile Organics-TICs												
[1,1'-Biphenyl]-4,4'-diamine, N,N,N',N'-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, diisooctyl-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6,10,14,18,22-Tetracosahexaene, 2,6,10	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
9-Octadecenoic acid, (E)-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetic acid, chloro-, octadecyl ester	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Cholestan-3-ol, 4-methyl-, (3.beta.,4.alpha)-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylene glycol dibenzoate	ug/L	--		NA	NA	8.1 JN	NA	NA	NA	NA	NA	NA
Heptadecane	ug/L	--		NA	NA	NA	NA	NA	NA	NA	4.2 JN	NA
Hexadecanoic Acid	ug/L	--		**4.3 JN**	NA	NA	NA	NA	NA	NA	NA	NA
N,N-Diethyl-3-Methylbenzamide	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Octadecanoic Acid	ug/L	--		**4.1 JN**	NA	NA	NA	NA	**3.8 JN**	NA	NA	NA
Octaethylene glycol monododecyl ether	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Oleic Acid	ug/L	--		NA	NA	**6.9 JN**	NA	**5.8 JN**	NA	NA	NA	NA
Oxirane, heptadecyl-	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetradecanoic acid	ug/L	--		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Alkanes	ug/L	--		NA	NA	NA	NA	NA	NA	0 JN	NA	NA
Tridecanoic acid	ug/L	--		NA	NA	NA	NA	**4.8 JN**	NA	NA	NA	NA
Inorganics												
Aluminum	ug/L	87	(i)	**63**	NA	**65**	**160**	**220**	**27**	NA	**33**	NA
Antimony	ug/L	80	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Arsenic	ug/L	150	(d) (e)	**2.7 B**	NA	<0.5	**0.76 J**	**0.8 J**	<0.5	NA	**0.52 J**	NA
Barium	ug/L	220	(c)	**220**	NA	**8.1**	**26**	**18**	**16**	NA	**44**	NA
Beryllium	ug/L	3.6	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Cadmium	ug/L	0.17	(a)	<0.4	NA	<0.4	<0.4	<0.4	<0.4	NA	<0.4	NA
Calcium	ug/L	--	(j)	**24,800**	NA	**10,200**	**9,700**	**8,700**	**48,500**	NA	**9,800**	NA
Chromium	ug/L	42	(c)	**2.1**	NA	<0.5	**0.59 J**	**1.1 J**	<0.5	NA	<0.5	NA
Cobalt	ug/L	24	(c)	**0.69 J**	NA	<0.5	**2.2**	**1.3 J**	<0.5	NA	<0.5	NA
Copper	ug/L	5.56	(a)	**1.2 J**	NA	<0.5	**1.6 J**	**0.61 J**	**0.85 J**	NA	**0.56 J**	NA
Iron	ug/L	--	(j)	**43,200**	NA	**170**	**3,100**	**8,700**	**420**	NA	**3,100**	NA
Lead	ug/L	5.4	(d) (e)	**0.81 J**	NA	<0.2	**1.2 J**	**0.91 J**	**0.29 J**	NA	**0.61 J**	NA
Magnesium	ug/L	--	(j)	**3,800**	NA	**2,800**	**3,100**	**2,700**	**12,800**	NA	**2,200**	NA
Manganese	ug/L	120	(i)	**810**	**662**	**22**	**1,300**	**980**	**230**	NA	**300**	**186**
Mercury	ug/L	0.77	(d) (e)	<0.15	NA	<0.15	<0.15	<0.15	<0.15	NA	<0.15	NA
Nickel	ug/L	31.24	(a)	**1.2 J**	NA	<0.5	**1.7 J**	**0.63 J**	<0.5	NA	<0.5	NA
Potassium	ug/L	--	(j)	**1,600**	NA	**580 J**	**640 J**	**280 J**	**3,800**	NA	**740 J**	NA
Selenium	ug/L	5	(d)	<0.6	NA	<0.6	<0.6	<0.93 B	<0.97 B	NA	**0.74 J**	NA
Silver	ug/L	0.12	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Sodium	ug/L	--	(j)	**4,700**	NA	**3,600**	**3,800**	**5,700**	**49,700**	NA	**3,500**	NA

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	SR-03-Seep-2 08/19/15 SR-3-SEEP2-081915	SR-03-Seep-2 12/16/15 SR3-SEEP-2-121615	SW-11 08/21/15 SW-11-082115	SW-MRB-01 08/20/15 SW-MRB-01-082015	SW-MRB-02 08/20/15 SW-MRB-02-082015	SW-MRB-03 08/20/15 SW-MRB-03-082015	SW-PAB-01 04/22/15 SW-PAB-01-042215	SW-PAB-01 08/21/15 SW-PAB-01-082115	SW-PAB-01 12/16/15 SW-PAB-01-121615
Thallium	ug/L	10	(c)	<0.2	NA	**0.79 J**	<0.2	<0.2	<0.2	NA	<0.2	NA
Vanadium	ug/L	12	(c)	**4 B**	NA	<1.8 B	**2.7 B**	**2.5 B**	<1.5 B	NA	<1.6 B	NA
Zinc	ug/L	71.69	(a)	<10	NA	<10	<10	<10	<10	NA	<10	NA
Inorganics-Filtered												
Aluminum	ug/L	87	(i)	<9.6	NA	**16 J**	**11 J**	**10 J**	<9.6	NA	<9.6	NA
Antimony	ug/L	80	(c)	<0.5	NA	**1.1 J**	**1.9 J**	**3.2**	**0.94 J**	NA	**1 J**	NA
Arsenic	ug/L	150	(d) (e)	<0.5	NA	<0.5	**0.59 J**	**0.54 J**	<0.5	NA	<0.5	NA
Barium	ug/L	220	(c)	**180**	NA	**7.9**	**22**	**15**	**16**	NA	**47**	NA
Beryllium	ug/L	3.6	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Cadmium	ug/L	0.17	(a)	<0.4	NA	<0.4	<0.4	<0.4	<0.4	NA	<0.4	NA
Calcium	ug/L	--	(j)	**24,400**	NA	**9,800**	**9,400**	**8,400**	**25,900**	NA	**8,800**	NA
Chromium	ug/L	42	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Cobalt	ug/L	24	(c)	<0.5	NA	<0.5	**0.6 J**	**0.57 J**	<0.5	NA	<0.5	NA
Copper	ug/L	5.56	(a)	<0.5	NA	**0.77 J**	**1.5 J**	<0.5	**0.77 J**	NA	**0.73 J**	NA
Iron	ug/L	--	(j)	**18 J**	NA	**63**	**320**	**840**	**36**	NA	**340**	NA
Lead	ug/L	5.4	(d) (e)	<0.2	NA	<0.2	<0.2	<0.2	<0.2	NA	<0.2	NA
Magnesium	ug/L	--	(j)	**3,900**	NA	**2,900**	**3,200**	**2,800**	**8,800**	NA	**2,100**	NA
Manganese	ug/L	120	(i)	**840**	NA	**15**	**640**	**500**	**170**	NA	**300**	NA
Mercury	ug/L	0.77	(d) (e)	<0.15	NA	<0.15	<0.15	<0.15	<0.15	NA	<0.15	NA
Nickel	ug/L	31.24	(a)	<0.5	NA	**0.52 J**	**1.8 J**	<0.5	**0.62 J**	NA	<0.5	NA
Potassium	ug/L	--	(j)	**1,500**	NA	**580 J**	**640 J**	**270 J**	**1,300**	NA	**680 J**	NA
Selenium	ug/L	5	(d)	<0.6	NA	<0.6	<0.6	<0.6	<0.6	NA	<0.6	NA
Silver	ug/L	0.12	(c)	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA
Sodium	ug/L	--	(j)	**3,500**	NA	**3,600**	**3,200**	**4,300**	**57,600**	NA	**3,200**	NA
Thallium	ug/L	10	(c)	<0.2	NA	**0.68 J**	<0.2	<0.2	<0.2	NA	<0.2	NA
Vanadium	ug/L	12	(c)	<0.97 B	NA	<1.1 B	<1.3 B	<1 B	<1.1 B	NA	<0.9 B	NA
Zinc	ug/L	71.69	(a)	<10	NA	<10	**18 J**	<10	<10	NA	<10	NA
Miscellaneous												
Alkalinity	ug/L	--		**91,400**	**84,100**	**30,600**	**37,100**	**30,000**	**38,700**	NA	**32,400**	**34,000**
Alkalinity, Bicarbonate	ug/L	--		**91,400**	NA	**30,600**	**37,100**	**30,000**	**38,700**	NA	**32,400**	NA
Bromide	ug/L	--		NA	<81	NA	NA	NA	NA	NA	NA	<81
Chloride	ug/L	--		**1,540**	**1,820**	**1,080**	**1,160**	**3,270**	**126,000**	NA	**1,070**	**2,000**
Cyanide	ug/L	--		<7	NA	<7	<7	<7	<7	NA	<7	NA
Fluoride, Total	ug/L	--		NA	**65 J**	NA	NA	NA	NA	NA	NA	**37 J**
Methane	ug/L	--		NA	**6,700**	NA	NA	NA	NA	NA	NA	**1,200**
Nitrate and Nitrite	ug/L	--		NA	<21	NA	NA	NA	NA	NA	NA	<21
Nitrate-N	ug/L	--		NA	<21	NA	NA	NA	NA	NA	NA	<21
Nitrite	ug/L	--		NA	<29	NA	NA	NA	NA	NA	NA	<29
Sulfate	ug/L	--		**1,520**	**2,210**	**7,000**	**1,610**	**1,380**	**6,400**	NA	**4,780**	**5,130**
Sulfide	ug/L	--		NA	<820	NA	NA	NA	NA	NA	NA	<820
Total Kjeldahl Nitrogen	ug/L	--		NA	**330**	NA	NA	NA	NA	NA	NA	<140
Total Organic Carbon	ug/L	--		NA	**2,200**	NA	NA	NA	NA	NA	NA	**1,800**

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Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	SW-PAB-01A 04/22/15 SW-PAB-01A-042215	SW-PAB-01A 08/21/15 SW-PAB-01A-082115	SW-PAB-01A 12/16/15 SW-PAB-01A-121615	SW-PAB-02 08/21/15 SW-PAB-02-082115	SW-PAB-03 08/21/15 SW-PAB-03-082115	SW-PMB-01 08/20/15 SW-PMB-01-082015	SW-PMB-02 08/20/15 SW-PMB-02-082015
PCBs										
Aroclor-1016	ug/L	--		NA	<0.38	NA	<0.38	<0.4	<0.37	<0.38
Aroclor-1221	ug/L	--		NA	<0.3	NA	<0.3	<0.31	<0.29	<0.3
Aroclor-1232	ug/L	--		NA	<0.36	NA	<0.36	<0.37	<0.34	<0.36
Aroclor-1242	ug/L	--		NA	<0.2	NA	<0.2	<0.2	<0.19	<0.2
Aroclor-1248	ug/L	--		NA	<0.13	NA	<0.13	<0.14	<0.13	<0.13
Aroclor-1254	ug/L	--		NA	<0.15	NA	<0.15	<0.16	<0.15	<0.15
Aroclor-1260	ug/L	--		NA	<0.16	NA	<0.16	<0.17	<0.16	<0.16
Total PCBs	ug/L	--		NA	<0.38	NA	<0.38	<0.4	<0.37	<0.38
Volatile Organics										
1,1,1-Trichloroethane	ug/L	76	(c)	<0.25	<0.19	<0.28	<0.19	<0.19	<0.19	<0.19
1,1,2,2-Tetrachloroethane	ug/L	380	(c)	<0.21	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
1,1,2-trichloro-1,2,2-trifluoroethane	ug/L	--		<0.52	<0.15	<0.34	<0.15	<0.15	<0.15	<0.15
1,1,2-Trichloroethane	ug/L	500	(c)	<0.21	<0.19	<0.08	<0.19	<0.19	<0.19	<0.19
1,1-Dichloroethane	ug/L	--		<0.17	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
1,1-Dichloroethene	ug/L	65	(c)	<0.51	<0.25	<0.34	<0.25	<0.25	<0.25	<0.25
1,2,4,5-Tetrachlorobenzene	ug/L	--		NA	<1.9	NA	<1.9	<1.9	<1.9	<1.9
1,2-Dibromo-3-chloropropane	ug/L	--		<0.99	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01
1,2-Dibromoethane	ug/L	--		<0.23	<0.01	<0.006	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	ug/L	14	(c)	<0.19	<0.19	<0.22	<0.19	<0.19	<0.19	<0.19
1,2-Dichloroethane	ug/L	910	(c)	<0.18	<0.2	<0.25	<0.2	<0.2	<0.2	<0.2
1,2-Dichloropropane	ug/L	360	(c)	<0.39	<0.25	<0.18	<0.25	<0.25	<0.25	<0.25
1,3-Dichlorobenzene	ug/L	38	(c)	<0.23	<0.18	<0.33	<0.18	<0.18	<0.18	<0.18
1,4-Dichlorobenzene	ug/L	9.4	(c)	<0.27	<0.17	<0.33	<0.17	<0.17	<0.17	<0.17
2-Butanone	ug/L	--		<5.6	<2.6	<2.2	<2.6	<2.6	<2.6	<2.6
2-Hexanone	ug/L	--		<1.7	<1.3	<0.72	<1.3	<1.3	<1.3	<1.3
4-Methyl-2-pentanone	ug/L	--		<1	<0.81	<0.63	<0.81	<0.81	<0.81	<0.81
Acetone	ug/L	--		<3.3	<2.7 J	<1.1	<2.7 J	<2.7 J	<2.7 J	<2.7 J
Bromochloromethane	ug/L	--		NA	NA	<0.3	NA	NA	NA	NA
Bromodichloromethane	ug/L	--		<0.23	<0.17	<0.15	<0.17	<0.17	<0.17	<0.17
Bromoform	ug/L	230	(c)	<0.23	<0.29	<0.18	<0.29	<0.29	<0.29	<0.29
Bromomethane	ug/L	16	(c)	<0.42	<0.35 J	<0.18	<0.35 J	<0.35 J	<0.35 J	<0.35 J
Carbon Disulfide	ug/L	--		<0.25	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
Carbon Tetrachloride	ug/L	240	(c)	<0.22	<0.18	<0.33	<0.18	<0.18	<0.18	<0.18
Chlorobenzene	ug/L	47	(c)	<0.19	<0.18	<0.24	<0.18	<0.18	<0.18	<0.18
Chloroethane	ug/L	--		<0.34	<0.36	<0.37	<0.36	<0.36	<0.36	<0.36
Chloroform	ug/L	140	(c)	<0.19	<0.23	<0.22	<0.23	<0.23	<0.23	<0.23
Chloromethane	ug/L	--		<0.41	<0.36 J	<0.22	<0.36 J	<0.36 J	<0.36 J	<0.36 J
cis-1,2-Dichloroethene	ug/L	590	(i)	<0.27	<0.21	<0.26	<0.21	<0.21	<0.21	<0.21
cis-1,3-Dichloropropene	ug/L	--		<0.21	<0.17	<0.16	<0.17	<0.17	<0.17	<0.17
Dibromochloromethane	ug/L	--		<0.15	<0.25	<0.22	<0.25	<0.25	<0.25	<0.25
Dichlorodifluoromethane	ug/L	--		<0.9	<0.17	<0.14	<0.17	<0.17	<0.17	<0.17
Isopropylbenzene	ug/L	--		<0.23	<0.33	<0.32	<0.33	<0.33	<0.33	<0.33

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	SW-PAB-01A 04/22/15 SW-PAB-01A-042215	SW-PAB-01A 08/21/15 SW-PAB-01A-082115	SW-PAB-01A 12/16/15 SW-PAB-01A-121615	SW-PAB-02 08/21/15 SW-PAB-02-082115	SW-PAB-03 08/21/15 SW-PAB-03-082115	SW-PMB-01 08/20/15 SW-PMB-01-082015	SW-PMB-02 08/20/15 SW-PMB-02-082015
Methyl acetate	ug/L	--		<1.9	<0.58 J	<0.58	<0.58 J	<0.58 J	<0.58 J	<0.58 J
Methylcyclohexane	ug/L	--		<0.22	<0.09	<0.22	<0.09	<0.09	<0.09	<0.09
Methylene Chloride	ug/L	940	(c)	<0.73	<0.22	<0.21	<0.22	<0.22	<0.22	<0.22
Styrene	ug/L	32	(c)	<0.27	<0.28	<0.17	<0.28	<0.28	<0.28	<0.28
Tetrachloroethene	ug/L	45	(c)	<0.4	<0.14	<0.12	<0.14	<0.14	<0.14	<0.14
trans-1,2-Dichloroethene	ug/L	970	(c)	<0.65	<0.23	<0.18	<0.23	<0.23	<0.23	<0.23
trans-1,3-Dichloropropene	ug/L	--		<0.19	<0.17	<0.19	<0.17	<0.17	<0.17	<0.17
Trichloroethene	ug/L	47	(c)	<0.22	<0.2	<0.22	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane	ug/L	--		<0.43	<0.21	<0.15	<0.21	<0.21	<0.21	<0.21
Vinyl Chloride	ug/L	930	(c)	<0.15	<0.18	<0.06	<0.18	<0.18	<0.18	<0.18
Benzene	ug/L	114	(c)	<0.24	<0.2	<0.09	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L	253	(c)	<0.16	<0.17	<0.25	<0.17	<0.17	<0.17	<0.17
Ethylbenzene	ug/L	14	(c)	<0.27	<0.19	<0.3	<0.19	<0.19	<0.19	<0.19
Xylenes (total)	ug/L	27	(c)	<0.17	<0.58	<0.28	<0.58	<0.58	<0.58	<0.58
Methyl tert-butyl ether	ug/L	51000	(f)	<0.24	<0.17	<0.13	<0.17	<0.17	<0.17	<0.17
Volatile Organics-TICs										
Total VOC TICs	ug/L	--		0 JN	NA	NA	NA	NA	NA	NA
Semivolatile Organics										
1,2,3-Trichlorobenzene	ug/L	--		NA	NA	<0.35	NA	NA	NA	NA
1,2,3-Trichloropropane	ug/L	--		NA	<0.01	NA	<0.01	<0.01	<0.01	<0.01
1,2,4-Trichlorobenzene	ug/L	30	(c)	<0.21	<0.2	<0.27	<0.2	<0.2	<0.2	<0.2
1,4-Dioxane	ug/L	22000	(k)	NA	**2.1 J**	**0.824**	**0.79 J**	**0.29 J**	**0.73 J**	**2.3 J**
2,2'-Oxybis(1-Chloropropane)	ug/L	--		NA	<2.5	NA	<2.5	<2.5	<2.5	<2.5
2,3,4,6-Tetrachlorophenol	ug/L	--		NA	<6.3	NA	<6.3	<6.2	<6.2	<6.2
2,4,5-Trichlorophenol	ug/L	--		NA	<6.5	NA	<6.5	<6.3	<6.3	<6.3
2,4,6-Trichlorophenol	ug/L	4.9	(c)	NA	<6.2	NA	<6.2	<6.1	<6.1	<6.1
2,4-Dichlorophenol	ug/L	11	(c)	NA	<5.1	NA	<5.1	<5	<5	<5
2,4-Dimethylphenol	ug/L	100	(c)	NA	<3.8	NA	<3.8	<3.8	<3.8	<3.8
2,4-Dinitrophenol	ug/L	19	(c)	NA	<5.4	NA	<5.4	<5.3	<5.3	<5.3
2,4-Dinitrotoluene	ug/L	44	(c)	NA	<2.9	NA	<2.9	<2.9	<2.9	<2.9
2,6-Dinitrotoluene	ug/L	--		NA	<2.1	NA	<2.1	<2.1	<2.1	<2.1
2-Chloronaphthalene	ug/L	0.396	(c)	NA	<2.5	NA	<2.5	<2.5	<2.5	<2.5
2-Chlorophenol	ug/L	24	(c)	NA	<4.4	NA	<4.4	<4.3	<4.3	<4.3
2-Methylnaphthalene	ug/L	330	(c)	NA	<0.36	NA	<0.36	<0.36	<0.36	<0.36
2-Methylphenol	ug/L	--		NA	<2.1	NA	<2.1	<2.1	<2.1	<2.1
2-Nitroaniline	ug/L	--		NA	<3.4	NA	<3.4	<3.3	<3.3	<3.3
2-Nitrophenol	ug/L	--		NA	<4.8	NA	<4.8	<4.7	<4.7	<4.7
3,3'-Dichlorobenzidine	ug/L	4.5	(c)	NA	<3	NA	<3	<2.9	<2.9	<2.9
3-Methylphenol, 4-Methylphenol	ug/L	--		NA	<2	NA	<2	<2	<2	<2
3-Nitroaniline	ug/L	--		NA	<2.5	NA	<2.5	<2.4	<2.4	<2.4
4,6-Dinitro-2-methylphenol	ug/L	--		NA	<8.5	NA	<8.5	<8.3	<8.3	<8.3
4-Bromophenyl-phenylether	ug/L	--		NA	<2.5	NA	<2.5	<2.4	<2.4	<2.4
4-Chloro-3-Methylphenol	ug/L	--		NA	<4.1	NA	<4.1	<4	<4	<4

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		SW-PAB-01A	SW-PAB-01A	SW-PAB-01A	SW-PAB-02	SW-PAB-03	SW-PMB-01	SW-PMB-02
Date Collected:				04/22/15	08/21/15	12/16/15	08/21/15	08/21/15	08/20/15	08/20/15
Sample Name:	Units	Chronic	Notes	SW-PAB-01A-042215	SW-PAB-01A-082115	SW-PAB-01A-121615	SW-PAB-02-082115	SW-PAB-03-082115	SW-PMB-01-082015	SW-PMB-02-082015
4-Chloroaniline	ug/L	--		NA	<3.8	NA	<3.8	<3.8	<3.8	<3.8
4-Chlorophenyl-phenylether	ug/L	--		NA	<2.5	NA	<2.5	<2.5	<2.5	<2.5
4-Nitroaniline	ug/L	--		NA	<2.8	NA	<2.8	<2.8	<2.8	<2.8
4-Nitrophenol	ug/L	60	(c)	NA	<4.9	NA	<4.9	<4.8	<4.8	<4.8
Acenaphthene	ug/L	38	(c)	NA	<0.29	NA	<0.29	<0.29	<0.29	<0.29
Acenaphthylene	ug/L	4840	(c)	NA	<0.32	NA	<0.32	<0.31	<0.31	<0.31
Acetophenone	ug/L	--		NA	<2.1	NA	<2.1	<2.1	<2.1	<2.1
Anthracene	ug/L	0.035	(c)	NA	<0.35	NA	<0.35	<0.34	<0.34	<0.34
Atrazine	ug/L	--		NA	<2.6	NA	<2.6	<2.6	<2.6	<2.6
Benzaldehyde	ug/L	--		NA	<5.2	NA	<5.2	<5.1	<5.1	<5.1
Benzo(a)anthracene	ug/L	0.025	(c)	NA	<0.025	NA	<0.025	<0.025	<0.025	<0.025
Benzo(a)pyrene	ug/L	0.014	(c)	NA	<0.025	NA	<0.025	<0.025	<0.025	<0.025
Benzo(b)fluoranthene	ug/L	9.07	(c)	NA	<0.025	NA	<0.025	<0.025	<0.025	<0.025
Benzo(g,h,i)perylene	ug/L	7.64	(c)	NA	<0.56	NA	<0.56	<0.55	<0.55	<0.55
Benzo(k)fluoranthene	ug/L	--		NA	<0.34	NA	<0.34	<0.33	<0.33	<0.33
bis(2-Chloroethoxy)methane	ug/L	--		NA	<2.8	NA	<2.8	<2.8	<2.8	<2.8
bis(2-Chloroethyl)ether	ug/L	1900	(c)	NA	<2.5	NA	<2.5	<2.5	<2.5	<2.5
bis(2-Ethylhexyl)phthalate	ug/L	77	(h)	NA	<5.5	NA	<5.5	<5.4	<5.4	<5.4
Butylbenzylphthalate	ug/L	23	(c)	NA	<2.3	NA	<2.3	<2.2	<2.2	<2.2
Caprolactam	ug/L	--		NA	<2.2	NA	<2.2	<2.1	<2.1	<2.1
Carbazole	ug/L	--		NA	<2.5	NA	<2.5	<2.5	<2.5	<2.5
Chrysene	ug/L	--		NA	<0.3	NA	<0.3	<0.29	<0.29	<0.29
Cyclohexane	ug/L	--		<0.28	<0.13	<0.26	<0.13	<0.13	<0.13	<0.13
Dibenzo(a,h)anthracene	ug/L	--		NA	<0.41	NA	<0.41	<0.4	<0.4	<0.4
Dibenzofuran	ug/L	--		NA	<2.6	NA	<2.6	<2.6	<2.6	<2.6
Diethylphthalate	ug/L	110	(c)	NA	<2.7	NA	<2.7	<2.7	<2.7	<2.7
Dimethylphthalate	ug/L	--		NA	<2.8	NA	<2.8	<2.8	<2.8	<2.8
Di-n-Butylphthalate	ug/L	9.7	(c)	NA	<2.3	NA	<2.3	<2.2	<2.2	<2.2
Di-n-Octylphthalate	ug/L	--		NA	<2.3	NA	<2.3	<2.2	<2.2	<2.2
Diphenyl ether	ug/L	--		NA	<2	NA	<2	<2	<2	<2
Fluoranthene	ug/L	1.9	(c)	NA	<0.29	NA	<0.29	<0.29	<0.29	<0.29
Fluorene	ug/L	19	(c)	NA	<0.29	NA	<0.29	<0.29	<0.29	<0.29
Hexachlorobenzene	ug/L	0.0003	(c)	NA	<0.014	NA	<0.014	<0.014	<0.014	<0.014
Hexachlorobutadiene	ug/L	0.053	(c)	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Hexachlorocyclopentadiene	ug/L	77	(c)	NA	<1.6	NA	<1.6	<1.6	<1.6	<1.6
Hexachloroethane	ug/L	8	(c)	NA	<1.7	NA	<1.7	<1.7	<1.7	<1.7
Indeno(1,2,3-cd)pyrene	ug/L	4.31	(c)	NA	<0.37	NA	<0.37	<0.37	<0.37	<0.37
Isophorone	ug/L	920	(c)	NA	<2.8	NA	<2.8	<2.8	<2.8	<2.8
Naphthalene	ug/L	13	(c)	NA	<0.34	NA	<0.34	<0.33	<0.33	<0.33
Nitrobenzene	ug/L	220	(c)	NA	<2.5	NA	<2.5	<2.4	<2.4	<2.4
N-Nitrosodimethylamine	ug/L	--		NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2
N-Nitroso-di-n-propylamine	ug/L	--		NA	<3.1	NA	<3.1	<3	<3	<3
N-Nitrosodiphenylamine	ug/L	--		NA	<3.3	NA	<3.3	<3.2	<3.2	<3.2

Appendix B
2015 Surface Water Monitoring Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID:		Ecologically Based Screening Levels (EBSLs)		SW-PAB-01A	SW-PAB-01A	SW-PAB-01A	SW-PAB-02	SW-PAB-03	SW-PMB-01	SW-PMB-02
Date Collected:				04/22/15	08/21/15	12/16/15	08/21/15	08/21/15	08/20/15	08/20/15
Sample Name:	Units	Chronic	Notes	SW-PAB-01A-042215	SW-PAB-01A-082115	SW-PAB-01A-121615	SW-PAB-02-082115	SW-PAB-03-082115	SW-PMB-01-082015	SW-PMB-02-082015
Pentachlorophenol	ug/L	--		NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Phenanthrene	ug/L	3.6	(c)	NA	<0.38	NA	<0.38	<0.38	<0.38	<0.38
Phenol	ug/L	180	(c)	NA	<1.4	NA	<1.4	<1.3	<1.3	<1.3
Pyrene	ug/L	0.3	(c)	NA	<0.32	NA	<0.32	<0.31	<0.31	<0.31
Semivolatile Organics-TICs										
[1,1'-Biphenyl]-4,4'-diamine, N,N,N',N'-	ug/L	--		NA	NA	NA	**4.6 JN**	NA	NA	NA
1,2-Benzenedicarboxylic acid, diisooctyl-	ug/L	--		NA	3.3 JN	NA	NA	NA	NA	NA
2,6,10,14,18,22-Tetracosahexaene, 2,6,10	ug/L	--		NA	NA	NA	3.2 JN	NA	NA	NA
9-Octadecenoic acid, (E)-	ug/L	--		NA	**6.5 JN**	NA	NA	NA	NA	NA
Acetic acid, chloro-, octadecyl ester	ug/L	--		NA	NA	NA	4.1 JN	NA	NA	NA
Cholestan-3-ol, 4-methyl-, (3.beta.,4.alpha)-	ug/L	--		NA	NA	NA	NA	NA	NA	NA
Diethylene glycol dibenzoate	ug/L	--		NA	NA	NA	NA	NA	NA	NA
Heptadecane	ug/L	--		NA	NA	NA	NA	NA	NA	NA
Hexadecanoic Acid	ug/L	--		NA	NA	NA	NA	NA	NA	NA
N,N-Diethyl-3-Methylbenzamide	ug/L	--		NA	NA	NA	NA	NA	NA	NA
Octadecanoic Acid	ug/L	--		NA	**3.2 JN**	NA	NA	**3.8 JN**	**3 JN**	NA
Octaethylene glycol monododecyl ether	ug/L	--		NA	3.1 JN	NA	NA	NA	NA	NA
Oleic Acid	ug/L	--		NA	NA	NA	**14 JN**	NA	NA	NA
Oxirane, heptadecyl-	ug/L	--		NA	NA	NA	3.2 JN	NA	NA	NA
Tetradecanoic acid	ug/L	--		NA	NA	NA	NA	NA	NA	NA
Total Alkanes	ug/L	--		0 JN	NA	NA	NA	NA	NA	NA
Tridecanoic acid	ug/L	--		NA	**4.9 JN**	NA	NA	NA	**4.8 JN**	NA
Inorganics										
Aluminum	ug/L	87	(i)	NA	**51**	NA	**10 J**	<9.6	**71**	**13 J**
Antimony	ug/L	80	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Arsenic	ug/L	150	(d) (e)	NA	**1.3 J**	NA	**0.56 J**	**0.54 J**	**1 J**	<0.5
Barium	ug/L	220	(c)	NA	**65**	NA	**73**	**62**	**55**	**15**
Beryllium	ug/L	3.6	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Cadmium	ug/L	0.17	(a)	NA	<0.4	NA	<0.4	<0.4	<0.4	<0.4
Calcium	ug/L	--	(j)	NA	**28,800**	NA	**29,400**	**25,300**	**49,400**	**26,700**
Chromium	ug/L	42	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Cobalt	ug/L	24	(c)	NA	**0.7 J**	NA	<0.5	<0.5	**0.55 J**	<0.5
Copper	ug/L	5.56	(a)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Iron	ug/L	--	(j)	NA	**7,300**	NA	**2,800**	**3,700**	**7,800**	**250**
Lead	ug/L	5.4	(d) (e)	NA	**0.28 J**	NA	<0.2	<0.2	**0.49 J**	<0.2
Magnesium	ug/L	--	(j)	NA	**5,000**	NA	**5,000**	**4,100**	**9,100**	**8,700**
Manganese	ug/L	120	(i)	NA	NA	**267**	**980**	**760**	**1,800**	**220**
Mercury	ug/L	0.77	(d) (e)	NA	<0.15	NA	<0.15	<0.15	<0.15	<0.15
Nickel	ug/L	31.24	(a)	NA	<0.5	NA	<0.5	<0.5	**0.53 J**	<0.5
Potassium	ug/L	--	(j)	NA	**1,700**	NA	**1,400**	**580 J**	**8,400**	**1,300**
Selenium	ug/L	5	(d)	NA	**0.63 J**	NA	<0.6	<0.6	<0.62 B	<0.6
Silver	ug/L	0.12	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Sodium	ug/L	--	(j)	NA	**4,500**	NA	**5,400**	**7,100**	**61,700**	**56,300**

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Location ID: / Date Collected: / Sample Name:	Units	Ecologically Based Screening Levels (EBSLs) Chronic	Notes	SW-PAB-01A 04/22/15 SW-PAB-01A-042215	SW-PAB-01A 08/21/15 SW-PAB-01A-082115	SW-PAB-01A 12/16/15 SW-PAB-01A-121615	SW-PAB-02 08/21/15 SW-PAB-02-082115	SW-PAB-03 08/21/15 SW-PAB-03-082115	SW-PMB-01 08/20/15 SW-PMB-01-082015	SW-PMB-02 08/20/15 SW-PMB-02-082015
Thallium	ug/L	10	(c)	NA	<0.2	NA	**0.33 J**	**1.1 J**	<0.2	<0.2
Vanadium	ug/L	12	(c)	NA	<1.7 B	NA	<1.4 B	<1.4 B	<1.6 B	<1.5 B
Zinc	ug/L	71.69	(a)	NA	<10	NA	<10	<10	<10	<10
Inorganics-Filtered										
Aluminum	ug/L	87	(i)	NA	<9.6	NA	<9.6	<9.6	<9.6	<9.6
Antimony	ug/L	80	(c)	NA	**0.84 J**	NA	**1 J**	**0.98 J**	**0.91 J**	**0.6 J**
Arsenic	ug/L	150	(d) (e)	NA	**0.62 J**	NA	<0.5	<0.5	**0.65 J**	<0.5
Barium	ug/L	220	(c)	NA	**50**	NA	**67**	**60**	**46**	**18**
Beryllium	ug/L	3.6	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Cadmium	ug/L	0.17	(a)	NA	<0.4	NA	<0.4	<0.4	<0.4	<0.4
Calcium	ug/L	--	(j)	NA	**27,000**	NA	**27,300**	**22,100**	**49,300**	**46,900**
Chromium	ug/L	42	(c)	NA	<0.5	NA	**3**	<0.5	<0.5	<0.5
Cobalt	ug/L	24	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Copper	ug/L	5.56	(a)	NA	**0.53 J**	NA	<0.5	<0.5	<0.5	**1.3 J**
Iron	ug/L	--	(j)	NA	**810**	NA	**82**	**73**	**560**	**23 J**
Lead	ug/L	5.4	(d) (e)	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Magnesium	ug/L	--	(j)	NA	**5,100**	NA	**4,900**	**3,800**	**9,500**	**13,100**
Manganese	ug/L	120	(i)	NA	**1,500**	NA	**600**	**690**	**1,100**	**160**
Mercury	ug/L	0.77	(d) (e)	NA	<0.15	NA	<0.15	<0.15	<0.15	<0.15
Nickel	ug/L	31.24	(a)	NA	**0.52 J**	NA	**0.53 J**	<0.5	**0.65 J**	**8.7**
Potassium	ug/L	--	(j)	NA	**1,700**	NA	**1,400**	**520 J**	**8,300**	**3,800**
Selenium	ug/L	5	(d)	NA	<0.6	NA	<0.6	<0.6	<0.6	<0.6
Silver	ug/L	0.12	(c)	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Sodium	ug/L	--	(j)	NA	**3,600**	NA	**5,300**	**6,400**	**64,300**	**51,000**
Thallium	ug/L	10	(c)	NA	**0.2 J**	NA	**0.4 J**	**0.88 J**	<0.2	<0.2
Vanadium	ug/L	12	(c)	NA	<0.79 B	NA	<0.79 B	<0.78 B	<0.9 B	<1.1 B
Zinc	ug/L	71.69	(a)	NA	<10	NA	**23 J**	<10	<10	<10
Miscellaneous										
Alkalinity	ug/L	--		NA	**92,100**	**46,100**	**88,400**	**65,600**	**147,000**	**138,000**
Alkalinity, Bicarbonate	ug/L	--		NA	**92,100**	NA	**88,400**	**65,600**	**147,000**	**138,000**
Bromide	ug/L	--		NA	NA	<81	NA	NA	NA	NA
Chloride	ug/L	--		NA	**1,750**	**2,090**	**3,880**	**8,420**	**112,000**	**87,000**
Cyanide	ug/L	--		NA	<7	NA	<7	<7	<7	<7
Fluoride, Total	ug/L	--		NA	NA	**62 J**	NA	NA	NA	NA
Methane	ug/L	--		NA	NA	**25**	NA	NA	NA	NA
Nitrate and Nitrite	ug/L	--		NA	NA	<21	NA	NA	NA	NA
Nitrate-N	ug/L	--		NA	NA	<21	NA	NA	NA	NA
Nitrite	ug/L	--		NA	NA	<29	NA	NA	NA	NA
Sulfate	ug/L	--		NA	**1,740**	**4,710**	**780 J**	**5,040**	**1,760**	**7,160**
Sulfide	ug/L	--		NA	NA	<820	NA	NA	NA	NA
Total Kjeldahl Nitrogen	ug/L	--		NA	NA	<140	NA	NA	NA	NA
Total Organic Carbon	ug/L	--		NA	NA	**1,600**	NA	NA	NA	NA

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General Notes:
Results are reported in micrograms per liter (ug/L).
Bolded results indicate concentrations above the detection limit
Shaded cells indicate exceedance of a screening value
[<1.8J] = Duplicate results presented in brackets.

Footnotes:
(a) = Criteria can be calculated following formula f3.
(b) = Criteria can be calculated following formula f4.
(c) = U.S. Environmental Protection Agency (USEPA) Region 5 Resource Conservation and Recovery Act Ecological Screening Levels.
(d) = Criterion is expressed as a function of the Water Effects Ratio.
(e) = Dissolved criterion.
(f) = USEPA Ambient Water Quality Criteria Update for Methyl Tertiary-Butyl Ether (MTBE) http://www.epa.gov/waterscience/criteria/mtbe-fs.html
(g) = Metals results are for unfiltered samples
(h) = Value is lowest NOEC reported for growth, survival, or reproduction endpoints from USEPA ECOTOX Database (http://cfpub.epa.gov/ecotox/quick_query.htm), original study Rhodes et. al. 1995.
(i) = Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (USEPA 2006)
(j) = Chemical considered an essential nutrient; therefore a screening level is not necessary
(k) = Michigan Department of Envornmental Quality (MDEQ) Rule 57 Water Quality Values

Acronyms and Abbreviations:
-- = value not available
< = not detected, detection limit presented
B = Indicates an estimated value between the instrument detection limit and the Reporting Limit (RL).
J = estimated result
E = Serial dilution results not within 10%. Applicable only if analyte concentration is at least 50X the IDL in original sample .
JN = indicates presumptive evidence at the estimated concentration shown from the lab
NA = not analyzed
NJDEP = New Jersey Department of Environmental Protection
R = data rejected

APPENDIX C

Sediment Analytical Results

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	PMP-SED-1 05/12/11	PMP-SED-2 05/12/11	PMP-SED-3 05/12/11	PMP-SED-4 05/12/11	PMP-SED-5 05/12/11	PMP-SED-6 05/12/11	SD-MRB-01 11/16/05	SD-MRB-02 11/15/05	SD-NOB-01 11/16/05	SD-PAB-01 11/16/05
Volatile Organic Compounds (VOCs)											
1,1,1-Trichloroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,1,2-Trichloroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,1-Dichloroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,1-Dichloroethene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,2,4-Trichlorobenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,2-Dibromo-3-chloropropane	mg/kg	0.018 U	0.033 U [0.04 U]	0.015 U	0.0097 U	0.015 U	0.016 U	0.025 U	0.025 U	0.016 U	0.031 U
1,2-Dibromoethane	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,2-Dichlorobenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,2-Dichloroethane	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,2-Dichloropropane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,3-Dichlorobenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
1,4-Dichlorobenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
2-Butanone	mg/kg	0.018 U	0.033 U [0.04 U]	0.015 U	0.0097 U	0.015 U	0.016 U	0.025 U	0.025 U	0.016 U	0.031 U
2-Hexanone	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
4-Methyl-2-pentanone	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Acetone	mg/kg	0.0328	0.0635 [0.0912]	0.015 U	0.0097 U	0.0241	0.016 U	0.025 U	0.025 U	0.016 U	0.0311
Bromodichloromethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Bromoform	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Bromomethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Carbon Disulfide	mg/kg	0.0011 J	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Carbon Tetrachloride	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Chlorobenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Chloroethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Chloroform	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Chloromethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
cis-1,2-Dichloroethene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
cis-1,3-Dichloropropene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Cyclohexane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Dibromochloromethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Dichlorodifluoromethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Isopropylbenzene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Methyl acetate	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.0454	0.0704	0.0080 U	0.0839
Methylcyclohexane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Methylene Chloride	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
o-Xylene	mg/kg	NA	NA	NA	NA	NA	NA	0.0025 U	0.0025 U	0.0016 U	0.0031 U
Styrene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Tetrachloroethene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Total Alkanes_VOCs	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
trans-1,3-Dichloropropene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Trichloroethene	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Trichlorofluoromethane	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Vinyl Chloride	mg/kg	0.0090 U	0.017 U [0.02 U]	0.0077 U	0.0048 U	0.0076 U	0.0080 U	0.012 U	0.012 U	0.0080 U	0.015 U
Xylene, -m,p	mg/kg	NA	NA	NA	NA	NA	NA	0.0049 U	0.0050 U	0.0032 U	0.0061 U
Benzene	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.0025 U	0.0025 U	0.0016 U	0.0031 U
Toluene	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.0025 U	0.0025 U	0.0016 U	0.0031 U
Ethylbenzene	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.0025 U	0.0025 U	0.0016 U	0.0031 U
Xylenes (total)	mg/kg	0.0036 U	0.0066 U [0.004 U]	0.0031 U	0.0019 U	0.0031 U	0.0032 U	0.0049 U	0.0050 U	0.0032 U	0.0061 U
Methyl tert-butyl ether	mg/kg	0.0018 U	0.0033 U [0.004 U]	0.0015 U	0.00097 U	0.0015 U	0.0016 U	0.0025 U	0.0025 U	0.0016 U	0.0031 U
Total VOC TICs	mg/kg	0	0 [0]	0	0	0	0	0	0	0	0

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	PMP-SED-1 05/12/11	PMP-SED-2 05/12/11	PMP-SED-3 05/12/11	PMP-SED-4 05/12/11	PMP-SED-5 05/12/11	PMP-SED-6 05/12/11	SD-MRB-01 11/16/05	SD-MRB-02 11/15/05	SD-NOB-01 11/16/05	SD-PAB-01 11/16/05
Semivolatile Organic Compounds (SVOCs)											
1,1'-Biphenyl	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
2,4,5-Trichlorophenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2,4,6-Trichlorophenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2,4-Dichlorophenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2,4-Dimethylphenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2,4-Dinitrophenol	mg/kg	1.0 U	1.1 U	0.91 U	0.74 U	0.98 U	1.2 U	1.5 U	1.6 U	0.94 U	1.6 U
2,4-Dinitrotoluene	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
2,6-Dinitrotoluene	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
2-Chloronaphthalene	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
2-Chlorophenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2-Methylnaphthalene	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
2-Methylphenol	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.37 U	0.39 U	0.24 U	0.40 U
2-Nitroaniline	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
2-Nitrophenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
3&4-Methylphenol	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.37 U	0.39 U	0.24 U	0.40 U
3,3'-Dichlorobenzidine	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
3-Nitroaniline	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
4,6-Dinitro-2-methylphenol	mg/kg	1.0 U	1.1 U	0.91 U	0.74 U	0.98 U	1.2 U	1.5 U	1.6 U	0.94 U	1.6 U
4-Bromophenyl-phenylether	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
4-Chloro-3-Methylphenol	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
4-Chloroaniline	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
4-Chlorophenyl-phenylether	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
4-Nitroaniline	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
4-Nitrophenol	mg/kg	0.51 U	0.55 U	0.46 U	0.37 U	0.49 U	0.60 U	1.5 U	1.6 U	0.94 U	1.6 U
Acenaphthene	mg/kg	0.0051 U	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.16 U	0.094 U	0.16 U
Acenaphthylene	mg/kg	0.0051 U	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.0558 J	0.094 U	0.16 U
Acetophenone	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
Anthracene	mg/kg	0.0051 U	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.0532 J	0.094 U	0.16 U
Atrazine	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
Benzaldehyde	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.0883 J	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
Benzo(a)anthracene	mg/kg	0.0346	0.0403	0.00748	0.00453	0.0146	0.00952	0.15 U	0.206	0.094 U	0.16 U
Benzo(a)pyrene	mg/kg	0.0180	0.0118	0.0046 U	0.00426	0.00808	0.00858	0.15 U	0.228	0.094 U	0.16 U
Benzo(b)fluoranthene	mg/kg	0.0271	0.0376	0.0138	0.0108	0.0230	0.0271	0.15 U	0.157 J	0.094 U	0.16 U
Benzo(g,h,i)perylene	mg/kg	0.0174	0.0157	0.00561	0.0037 U	0.0104	0.0632	0.15 U	0.119 J	0.094 U	0.16 U
Benzo(k)fluoranthene	mg/kg	0.0177	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.169	0.094 U	0.16 U
bis(2-Chloroethoxy)methane	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
bis(2-Chloroethyl)ether	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
bis(2-Chloroisopropyl)ether	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
bis(2-Ethylhexyl)phthalate	mg/kg	0.0668 J	0.188	0.371	0.074 U	0.153	0.12 U	0.15 U	0.16 UJB	0.094 U	0.16 U
Butylbenzylphthalate	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Caprolactam	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Carbazole	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Chrysene	mg/kg	0.0244	0.0193	0.00526	0.00364 J	0.00955	0.00833	0.15 U	0.286	0.094 U	0.16 U
Dibenzo(a,h)anthracene	mg/kg	0.00662	0.00626	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.16 U	0.094 U	0.16 U
Dibenzofuran	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Diethylphthalate	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Dimethylphthalate	mg/kg	0.10 U	0.0839 J	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Di-n-Butylphthalate	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Di-n-Octylphthalate	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Fluoranthene	mg/kg	0.0303	0.0227	0.00491	0.00737	0.0137	0.0134	0.15 U	0.364	0.094 U	0.16 U
Fluorene	mg/kg	0.0051 U	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.16 U	0.094 U	0.16 U
Hexachlorobenzene	mg/kg	0.0051 U	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.16 U	0.094 U	0.16 U

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	PMP-SED-1 05/12/11	PMP-SED-2 05/12/11	PMP-SED-3 05/12/11	PMP-SED-4 05/12/11	PMP-SED-5 05/12/11	PMP-SED-6 05/12/11	SD-MRB-01 11/16/05	SD-MRB-02 11/15/05	SD-NOB-01 11/16/05	SD-PAB-01 11/16/05
Hexachlorobutadiene	mg/kg	0.051 U	0.055 U	0.046 U	0.037 U	0.049 U	0.060 U	0.15 U	0.16 U	0.094 U	0.16 U
Hexachlorocyclopentadiene	mg/kg	1.0 U	1.1 U	0.91 U	0.74 U	0.98 U	1.2 U	1.5 U	1.6 U	0.94 U	1.6 U
Hexachloroethane	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.0170	0.0148	0.00583	0.0037 U	0.00841	0.0136	0.15 U	0.0976 J	0.094 U	0.16 U
Isophorone	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
Naphthalene	mg/kg	0.00703	0.0055 U	0.0046 U	0.0037 U	0.0049 U	0.0060 U	0.15 U	0.16 U	0.094 U	0.16 U
Nitrobenzene	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
N-Nitroso-di-n-propylamine	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.15 U	0.16 U	0.094 U	0.16 U
N-Nitrosodiphenylamine	mg/kg	0.25 U	0.27 U	0.23 U	0.18 U	0.24 U	0.30 U	0.37 U	0.39 U	0.24 U	0.40 U
Pentachlorophenol_SVOCs	mg/kg	0.025 U	0.027 U	0.023 U	0.018 U	0.024 U	0.030 U	1.5 U	1.6 U	0.94 U	1.6 U
Phenanthrene	mg/kg	0.00940	0.0114	0.0046 U	0.00448	0.00799	0.00799	0.15 U	0.267	0.094 U	0.16 U
Phenol	mg/kg	0.10 U	0.11 U	0.091 U	0.074 U	0.098 U	0.12 U	0.37 U	0.39 U	0.24 U	0.40 U
Pyrene	mg/kg	0.0330	0.0295	0.00753	0.00895	0.0205	0.0118	0.15 U	0.526	0.094 U	0.16 U
Total Alkanes_SVOCs	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SVOC TICs	mg/kg	44.7 J	73.47 J	19.85 J	11.86 J	45.41 J	225.6 J	14.74 J	11.15 J	0.44 J	10.21 J
Polychlorinated Biphenyls (PCBs)											
Aroclor-1016	mg/kg	0.0052 U	0.0056 U	0.0047 U	0.0043 U	0.0050 U	0.0062 U	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1221	mg/kg	0.0052 U	0.0056 U	0.0047 U	0.0043 U	0.0050 U	0.0062 U	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1232	mg/kg	0.0052 U	0.0056 U	0.0047 U	0.0043 U	0.0050 U	0.0062 U	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1242	mg/kg	0.0052 U	0.0056 U	0.0047 U	0.0043 U	0.0050 U	0.0078	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1248	mg/kg	0.0052 U	0.0056 U	0.0047 U	0.0043 U	0.0050 U	0.0062 U	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1254	mg/kg	0.0074	0.0257	0.0136	0.0043 U	0.0050 U	0.0093	0.074 U	0.077 U	0.047 U	0.081 U
Aroclor-1260	mg/kg	0.0103	0.0119	0.0196	0.0043 U	0.0050 U	0.0084	0.074 U	0.077 U	0.047 U	0.081 U
Metals											
Aluminum	mg/kg	5,250	6,310	4,780	5,270	6,510	6,540	14,600	17,900	19,400	5,440
Antimony	mg/kg	4.1 B	38 U	31 U	27 U	35 U	41 U	1.1 U	2.3 U	1.4 U	1.6 U
Arsenic	mg/kg	62.6	50.1	68.4	49.4	58.5	71.6	1.9	3.0	3.9	6.0
Barium	mg/kg	37.3 B	49.8 B	34.1 B	28.2 B	52.0 B	45.8 B	80.0	96.6	64.5	37.0
Beryllium	mg/kg	3.5 U	3.8 U	3.1 U	2.7 U	3.5 U	4.1 U	0.78	1.1 U	0.93	0.79 U
Cadmium	mg/kg	8.8 U	2.1 B	7.8 U	6.7 U	8.8 U	10 U	0.57 U	1.1 U	0.72 U	0.79 U
Calcium	mg/kg	49,000	40,200	50,900	43,600	48,000	50,400	1,880	2,110	1,530	3,590
Chromium	mg/kg	12.4 B	14.3 B	11.2 B	11.8 B	13.4 B	12.4 B	16.1	22.0	28.7	7.7
Cobalt	mg/kg	10.5 B	9.9 B	9.6 B	11.2 B	12.7 B	10.2 B	7.6	11.1	8.5	7.9 U
Copper	mg/kg	40.2 B	32.4 B	29.2 B	21.7 B	27.2 B	46.0 B	38.7	53.5	17.0	18.8
Iron	mg/kg	45,500	36,500	35,800	59,700	42,900	36,300	12,400	14,300	45,100	17,200
Lead	mg/kg	63.7	28.5 B	54.7	11.8 B	15.4 B	27.1 B	25.9	70.3	7.6	19.6
Magnesium	mg/kg	5,530 B	5,260 B	5,220 B	5,170 B	7,080 B	6,290 B	2,100	2,950	2,650	1,410
Manganese	mg/kg	266	258	257	245	334	297	399	251	229	209
Mercury	mg/kg	0.044 B	0.039 B	0.091	0.040 U	0.041 B	0.081	0.12	0.16	0.047 U	0.083
Nickel	mg/kg	17.3 B	15.1 B	14.9 B	16.2 B	17.9 B	16.7 B	14.4	21.6	19.5	10.4
Potassium	mg/kg	686 B	861 B	205 B	1,140 B	1,250 B	836 B	862	1,100 U	776	790 U
Selenium	mg/kg	35 U	38 U	31 U	27 U	35 U	41 U	1.1 U	2.3 U	1.4 U	1.6 U
Silver	mg/kg	8.8 U	9.6 U	7.8 U	6.7 U	8.8 U	10 U	1.1 U	2.3 U	1.4 U	1.6 U
Sodium	mg/kg	1,410 B	1,490 B	1,770 B	1,200 B	1,070 B	1,150 B	570 U	1,100 U	720 U	790 U
Thallium	mg/kg	18 U	19 U	16 U	13 U	18 U	20 U	1.1 U	2.3 U	1.4 U	1.6 U
Vanadium	mg/kg	99.6	83.5 B	82.9	108	92.2	91.5 B	30.1	40.0	58.8	24.4
Zinc	mg/kg	207	355	120	47.5	122	165	58.5	102	41.7	76.2
Pesticides											
2,4,5-T	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-4-Chlorophenoxyacetic Acid	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	PMP-SED-1 05/12/11	PMP-SED-2 05/12/11	PMP-SED-3 05/12/11	PMP-SED-4 05/12/11	PMP-SED-5 05/12/11	PMP-SED-6 05/12/11	SD-MRB-01 11/16/05	SD-MRB-02 11/15/05	SD-NOB-01 11/16/05	SD-PAB-01 11/16/05
4,4'-DDD	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beta-BHC	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dalapon	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dicamba	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorprop	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-BHC (Lindane)	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPP	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol_Pesticides	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	SD-PAB-02 11/16/05	SD-PAB-03 11/16/05	SD-PMB-01 11/16/05
Volatile Organic Compounds (VOCs)				
1,1,1-Trichloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,1,2,2-Tetrachloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,1,2-trichloro-1,2,2-trifluoroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,1,2-Trichloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,1-Dichloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,1-Dichloroethene	mg/kg	0.0079 U	0.0063 U	0.050 U
1,2,4-Trichlorobenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
1,2-Dibromo-3-chloropropane	mg/kg	0.016 U	0.013 U	0.099 U
1,2-Dibromoethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,2-Dichlorobenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
1,2-Dichloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,2-Dichloropropane	mg/kg	0.0079 U	0.0063 U	0.050 U
1,3-Dichlorobenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
1,4-Dichlorobenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
2-Butanone	mg/kg	0.016 U	0.013 U	0.127
2-Hexanone	mg/kg	0.0079 U	0.0063 U	0.050 U
4-Methyl-2-pentanone	mg/kg	0.0079 U	0.0063 U	0.050 U
Acetone	mg/kg	0.016 U	0.013 U	0.278
Bromodichloromethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Bromoform	mg/kg	0.0079 U	0.0063 U	0.050 U
Bromomethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Carbon Disulfide	mg/kg	0.0079 U	0.0063 U	0.050 U
Carbon Tetrachloride	mg/kg	0.0079 U	0.0063 U	0.050 U
Chlorobenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
Chloroethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Chloroform	mg/kg	0.0079 U	0.0063 U	0.050 U
Chloromethane	mg/kg	0.0079 U	0.0063 U	0.050 U
cis-1,2-Dichloroethene	mg/kg	0.0079 U	0.0063 U	0.050 U
cis-1,3-Dichloropropene	mg/kg	0.0079 U	0.0063 U	0.050 U
Cyclohexane	mg/kg	0.0079 U	0.0063 U	0.050 U
Dibromochloromethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Dichlorodifluoromethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Isopropylbenzene	mg/kg	0.0079 U	0.0063 U	0.050 U
Methyl acetate	mg/kg	0.0338	0.0080	0.174
Methylcyclohexane	mg/kg	0.0079 U	0.0063 U	0.050 U
Methylene Chloride	mg/kg	0.0079 U	0.0063 U	0.050 U
o-Xylene	mg/kg	0.0016 U	0.0013 U	0.0099 U
Styrene	mg/kg	0.0079 U	0.0063 U	0.050 U
Tetrachloroethene	mg/kg	0.0079 U	0.0063 U	0.050 U
Total Alkanes_VOCs	mg/kg	NA	NA	NA
trans-1,2-Dichloroethene	mg/kg	0.0079 U	0.0063 U	0.050 U
trans-1,3-Dichloropropene	mg/kg	0.0079 U	0.0063 U	0.050 U
Trichloroethene	mg/kg	0.0079 U	0.0063 U	0.050 U
Trichlorofluoromethane	mg/kg	0.0079 U	0.0063 U	0.050 U
Vinyl Chloride	mg/kg	0.0079 U	0.0063 U	0.050 U
Xylene, -m,p	mg/kg	0.0031 U	0.0025 U	0.020 U
Benzene	mg/kg	0.0016 U	0.0013 U	0.0099 U
Toluene	mg/kg	0.0016 U	0.0013 U	0.0099 U
Ethylbenzene	mg/kg	0.0016 U	0.0013 U	0.0099 U
Xylenes (total)	mg/kg	0.0031 U	0.0025 U	0.020 U
Methyl tert-butyl ether	mg/kg	0.0016 U	0.0013 U	0.0099 U
Total VOC TICs	mg/kg	0	0	0

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	SD-PAB-02 11/16/05	SD-PAB-03 11/16/05	SD-PMB-01 11/16/05
Semivolatile Organic Compounds (SVOCs)				
1,1'-Biphenyl	mg/kg	0.087 U	0.081 U	0.59 U
2,4,5-Trichlorophenol	mg/kg	0.22 U	0.20 U	1.5 U
2,4,6-Trichlorophenol	mg/kg	0.22 U	0.20 U	1.5 U
2,4-Dichlorophenol	mg/kg	0.22 U	0.20 U	1.5 U
2,4-Dimethylphenol	mg/kg	0.22 U	0.20 U	1.5 U
2,4-Dinitrophenol	mg/kg	0.87 U	0.81 U	5.9 U
2,4-Dinitrotoluene	mg/kg	0.087 U	0.081 U	0.59 U
2,6-Dinitrotoluene	mg/kg	0.087 U	0.081 U	0.59 U
2-Chloronaphthalene	mg/kg	0.087 U	0.081 U	0.59 U
2-Chlorophenol	mg/kg	0.22 U	0.20 U	1.5 U
2-Methylnaphthalene	mg/kg	0.087 U	0.081 U	0.59 U
2-Methylphenol	mg/kg	0.22 U	0.20 U	1.5 U
2-Nitroaniline	mg/kg	0.22 U	0.20 U	1.5 U
2-Nitrophenol	mg/kg	0.22 U	0.20 U	1.5 U
3&4-Methylphenol	mg/kg	0.22 U	0.20 U	1.5 U
3,3'-Dichlorobenzidine	mg/kg	0.22 U	0.20 U	1.5 U
3-Nitroaniline	mg/kg	0.22 U	0.20 U	1.5 U
4,6-Dinitro-2-methylphenol	mg/kg	0.87 U	0.81 U	5.9 U
4-Bromophenyl-phenylether	mg/kg	0.087 U	0.081 U	0.59 U
4-Chloro-3-Methylphenol	mg/kg	0.22 U	0.20 U	1.5 U
4-Chloroaniline	mg/kg	0.22 U	0.20 U	1.5 U
4-Chlorophenyl-phenylether	mg/kg	0.087 U	0.081 U	0.59 U
4-Nitroaniline	mg/kg	0.22 U	0.20 U	1.5 U
4-Nitrophenol	mg/kg	0.87 U	0.81 U	5.9 U
Acenaphthene	mg/kg	0.087 U	0.081 U	0.59 U
Acenaphthylene	mg/kg	0.087 U	0.081 U	0.59 U
Acetophenone	mg/kg	0.22 U	0.20 U	1.5 U
Anthracene	mg/kg	0.087 U	0.081 U	0.59 U
Atrazine	mg/kg	0.22 U	0.20 U	1.5 U
Benzaldehyde	mg/kg	0.22 U	0.20 U	1.5 U
Benzo(a)anthracene	mg/kg	0.087 U	0.081 U	0.59 U
Benzo(a)pyrene	mg/kg	0.087 U	0.081 U	0.59 U
Benzo(b)fluoranthene	mg/kg	0.087 U	0.081 U	0.59 U
Benzo(g,h,i)perylene	mg/kg	0.087 U	0.081 U	0.59 U
Benzo(k)fluoranthene	mg/kg	0.087 U	0.081 U	0.59 U
bis(2-Chloroethoxy)methane	mg/kg	0.087 U	0.081 U	0.59 U
bis(2-Chloroethyl)ether	mg/kg	0.087 U	0.081 U	0.59 U
bis(2-Chloroisopropyl)ether	mg/kg	0.087 U	0.081 U	0.59 U
bis(2-Ethylhexyl)phthalate	mg/kg	0.087 U	0.081 U	0.59 U
Butylbenzylphthalate	mg/kg	0.087 U	0.081 U	0.59 U
Caprolactam	mg/kg	0.087 U	0.081 U	0.59 U
Carbazole	mg/kg	0.087 U	0.081 U	0.59 U
Chrysene	mg/kg	0.087 U	0.081 U	0.191 J
Dibenzo(a,h)anthracene	mg/kg	0.087 U	0.081 U	0.59 U
Dibenzofuran	mg/kg	0.087 U	0.081 U	0.59 U
Diethylphthalate	mg/kg	0.087 U	0.081 U	0.59 U
Dimethylphthalate	mg/kg	0.087 U	0.081 U	0.59 U
Di-n-Butylphthalate	mg/kg	0.087 U	0.081 U	0.59 U
Di-n-Octylphthalate	mg/kg	0.087 U	0.081 U	0.59 U
Fluoranthene	mg/kg	0.087 U	0.081 U	0.233 J
Fluorene	mg/kg	0.087 U	0.081 U	0.59 U
Hexachlorobenzene	mg/kg	0.087 U	0.081 U	0.59 U

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: / Date Collected:	Units	SD-PAB-02 11/16/05	SD-PAB-03 11/16/05	SD-PMB-01 11/16/05
Hexachlorobutadiene	mg/kg	0.087 U	0.081 U	0.59 U
Hexachlorocyclopentadiene	mg/kg	0.87 U	0.81 U	5.9 U
Hexachloroethane	mg/kg	0.22 U	0.20 U	1.5 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.087 U	0.081 U	0.59 U
Isophorone	mg/kg	0.087 U	0.081 U	0.59 U
Naphthalene	mg/kg	0.087 U	0.081 U	0.59 U
Nitrobenzene	mg/kg	0.087 U	0.081 U	0.59 U
N-Nitroso-di-n-propylamine	mg/kg	0.087 U	0.081 U	0.59 U
N-Nitrosodiphenylamine	mg/kg	0.22 U	0.20 U	1.5 U
Pentachlorophenol_SVOCs	mg/kg	0.87 U	0.81 U	5.9 U
Phenanthrene	mg/kg	0.087 U	0.081 U	0.173 J
Phenol	mg/kg	0.22 U	0.20 U	1.5 U
Pyrene	mg/kg	0.087 U	0.081 U	0.245 J
Total Alkanes_SVOCs	mg/kg	NA	NA	NA
Total SVOC TICs	mg/kg	0.39 J	0	52.3 J
Polychlorinated Biphenyls (PCBs)				
Aroclor-1016	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1221	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1232	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1242	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1248	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1254	mg/kg	0.044 U	0.041 U	0.30 U
Aroclor-1260	mg/kg	0.044 U	0.041 U	0.30 U
Metals				
Aluminum	mg/kg	3,710	15,400	30,000
Antimony	mg/kg	2.6 U	1.2 U	7.4 U
Arsenic	mg/kg	14.5	7.2	36.8
Barium	mg/kg	52 U	76.5	250
Beryllium	mg/kg	1.3 U	0.60 U	3.7 U
Cadmium	mg/kg	1.3 U	0.60 U	4.9
Calcium	mg/kg	12,300	6,010	31,100
Chromium	mg/kg	7.1	16.2	51.7
Cobalt	mg/kg	13 U	6.0 U	43.2
Copper	mg/kg	7.4	8.1	141
Iron	mg/kg	37,600	12,000	125,000
Lead	mg/kg	5.4	4.5	384
Magnesium	mg/kg	2,380	2,160	14,100
Manganese	mg/kg	323	168	3,170
Mercury	mg/kg	0.042 U	0.040 U	0.50
Nickel	mg/kg	10 U	12.6	82.9
Potassium	mg/kg	1,300 U	1,560	3,740
Selenium	mg/kg	2.6 U	1.2 U	7.4 U
Silver	mg/kg	2.6 U	1.2 U	7.4 U
Sodium	mg/kg	1,300 U	600 U	3,700 U
Thallium	mg/kg	2.6 U	1.2 U	7.4 U
Vanadium	mg/kg	61.2	27.0	163
Zinc	mg/kg	31.2	47.1	561
Pesticides				
2,4,5-T	mg/kg	NA	NA	NA
2,4,5-TP	mg/kg	NA	NA	NA
2,4-D	mg/kg	NA	NA	NA
2,4-DB	mg/kg	NA	NA	NA
2-Methyl-4-Chlorophenoxyacetic Acid	mg/kg	NA	NA	NA

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Location ID: Date Collected:	Units	SD-PAB-02 11/16/05	SD-PAB-03 11/16/05	SD-PMB-01 11/16/05
4,4'-DDD	mg/kg	NA	NA	NA
4,4'-DDE	mg/kg	NA	NA	NA
4,4'-DDT	mg/kg	NA	NA	NA
Aldrin	mg/kg	NA	NA	NA
Alpha-BHC	mg/kg	NA	NA	NA
Alpha-Chlordane	mg/kg	NA	NA	NA
Beta-BHC	mg/kg	NA	NA	NA
Dalapon	mg/kg	NA	NA	NA
Delta-BHC	mg/kg	NA	NA	NA
Dicamba	mg/kg	NA	NA	NA
Dichlorprop	mg/kg	NA	NA	NA
Dieldrin	mg/kg	NA	NA	NA
Dinoseb	mg/kg	NA	NA	NA
Endosulfan I	mg/kg	NA	NA	NA
Endosulfan II	mg/kg	NA	NA	NA
Endosulfan Sulfate	mg/kg	NA	NA	NA
Endrin	mg/kg	NA	NA	NA
Endrin Aldehyde	mg/kg	NA	NA	NA
Endrin Ketone	mg/kg	NA	NA	NA
Gamma-BHC (Lindane)	mg/kg	NA	NA	NA
Gamma-Chlordane	mg/kg	NA	NA	NA
Heptachlor	mg/kg	NA	NA	NA
Heptachlor Epoxide	mg/kg	NA	NA	NA
MCPP	mg/kg	NA	NA	NA
Methoxychlor	mg/kg	NA	NA	NA
Pentachlorophenol_Pesticides	mg/kg	NA	NA	NA
Toxaphene	mg/kg	NA	NA	NA

Appendix C
Sediment Analytical Results
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Notes:

B	=	Indicates an estimated value between the instrument detection limit and the Reporting Limit (RL)
J	=	Indicates an estimated value.
U	=	The compound was analyzed for but not detected. The associated value is the compound quantitation limit
NA	=	Not analyzed
[0.02]	=	Duplicate results presented in brackets
mg/kg	=	Milligrams per kilogram

APPENDIX D

ProUCL Output Files

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/7/2016 12:54:12 PM
From File	2016 Onsite SW dataset.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Result (1,4-dioxane)

General Statistics

Total Number of Observations	20	Number of Distinct Observations	15
Number of Detects	13	Number of Non-Detects	7
Number of Distinct Detects	13	Number of Distinct Non-Detects	2
Minimum Detect	0.29	Minimum Non-Detect	0.059
Maximum Detect	3.56	Maximum Non-Detect	0.27
Variance Detects	0.798	Percent Non-Detects	35%
Mean Detects	1.567	SD Detects	0.893
Median Detects	1.6	CV Detects	0.57
Skewness Detects	0.664	Kurtosis Detects	0.509
Mean of Logged Detects	0.269	SD of Logged Detects	0.675

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.932	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.182	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.039	KM Standard Error of Mean	0.232
KM SD	0.998	95% KM (BCA) UCL	1.483
95% KM (t) UCL	1.441	95% KM (Percentile Bootstrap) UCL	1.438
95% KM (z) UCL	1.421	95% KM Bootstrap t UCL	1.471
90% KM Chebyshev UCL	1.736	95% KM Chebyshev UCL	2.051
97.5% KM Chebyshev UCL	2.489	99% KM Chebyshev UCL	3.35

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.4	Anderson-Darling GOF Test
5% A-D Critical Value	0.739	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.238	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.93	k star (bias corrected MLE)	2.305
Theta hat (MLE)	0.535	Theta star (bias corrected MLE)	0.68
nu hat (MLE)	76.17	nu star (bias corrected)	59.93
Mean (detects)	1.567		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.044
Maximum	3.56	Median	0.802
SD	1.021	CV	0.978
k hat (MLE)	0.553	k star (bias corrected MLE)	0.503
Theta hat (MLE)	1.888	Theta star (bias corrected MLE)	2.074
nu hat (MLE)	22.11	nu star (bias corrected)	20.13
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (20.13, α)	10.95	Adjusted Chi Square Value (20.13, β)	10.41
95% Gamma Approximate UCL (use when n>=50)	1.919	95% Gamma Adjusted UCL (use when n<50)	2.018

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.039	SD (KM)	0.998
Variance (KM)	0.996	SE of Mean (KM)	0.232
k hat (KM)	1.084	k star (KM)	0.955
nu hat (KM)	43.37	nu star (KM)	38.2
theta hat (KM)	0.958	theta star (KM)	1.088
80% gamma percentile (KM)	1.678	90% gamma percentile (KM)	2.42
95% gamma percentile (KM)	3.164	99% gamma percentile (KM)	4.898

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (38.20, α)	25.04	Adjusted Chi Square Value (38.20, β)	24.2
95% Gamma Approximate KM-UCL (use when n>=50)	1.585	95% Gamma Adjusted KM-UCL (use when n<50)	1.64

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.925	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.171	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.117	Mean in Log Scale	-0.29
SD in Original Scale	0.95	SD in Log Scale	0.974
95% t UCL (assumes normality of ROS data)	1.484	95% Percentile Bootstrap UCL	1.489
95% BCA Bootstrap UCL	1.504	95% Bootstrap t UCL	1.583
95% H-UCL (Log ROS)	2.145		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.816	KM Geo Mean	0.442
KM SD (logged)	1.568	95% Critical H Value (KM-Log)	3.542
KM Standard Error of Mean (logged)	0.365	95% H-UCL (KM -Log)	5.402
KM SD (logged)	1.568	95% Critical H Value (KM-Log)	3.542
KM Standard Error of Mean (logged)	0.365		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.06	Mean in Log Scale	-0.602
SD in Original Scale	1.003	SD in Log Scale	1.369
95% t UCL (Assumes normality)	1.448	95% H-Stat UCL	3.828

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 1.441

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (alkalinity)

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	30000	Mean	72625
Maximum	147000	Median	77150
SD	34128	Std. Error of Mean	7631
Coefficient of Variation	0.47	Skewness	0.548

Normal GOF Test

Shapiro Wilk Test Statistic	0.914	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.14	Lilliefors GOF Test
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	85820	95% Adjusted-CLT UCL (Chen-1995)	86176
		95% Modified-t UCL (Johnson-1978)	85976

Gamma GOF Test

A-D Test Statistic	0.693	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.156	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.559	k star (bias corrected MLE)	3.909
Theta hat (MLE)	15929	Theta star (bias corrected MLE)	18580
nu hat (MLE)	182.4	nu star (bias corrected)	156.4
MLE Mean (bias corrected)	72625	MLE Sd (bias corrected)	36733
		Approximate Chi Square Value (0.05)	128.4
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	126.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	88403	95% Adjusted Gamma UCL (use when n<50)	89800

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.909	Shapiro Wilk Lognormal GOF Test

5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	10.31	Mean of logged Data	11.08
Maximum of Logged Data	11.9	SD of logged Data	0.504

Assuming Lognormal Distribution

95% H-UCL	92985	90% Chebyshev (MVUE) UCL	98704
95% Chebyshev (MVUE) UCL	110310	97.5% Chebyshev (MVUE) UCL	126419
99% Chebyshev (MVUE) UCL	158061		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	85177	95% Jackknife UCL	85820
95% Standard Bootstrap UCL	84662	95% Bootstrap-t UCL	87203
95% Hall's Bootstrap UCL	86784	95% Percentile Bootstrap UCL	85400
95% BCA Bootstrap UCL	86070		
90% Chebyshev(Mean, Sd) UCL	95518	95% Chebyshev(Mean, Sd) UCL	105888
97.5% Chebyshev(Mean, Sd) UCL	120282	99% Chebyshev(Mean, Sd) UCL	148554

Suggested UCL to Use

95% Student's-t UCL	85820

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (alkalinity, bicarbonate)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	30000	Mean	73436
Maximum	147000	Median	77150
SD	37814	Std. Error of Mean	10106
Coefficient of Variation	0.515	Skewness	0.604

Normal GOF Test

Shapiro Wilk Test Statistic	0.896	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	91333	95% Adjusted-CLT UCL (Chen-1995)	91802

		95% Modified-t UCL (Johnson-1978)	91605

Gamma GOF Test

A-D Test Statistic	0.577	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.191	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.932	k star (bias corrected MLE)	3.137
Theta hat (MLE)	18676	Theta star (bias corrected MLE)	23409
nu hat (MLE)	110.1	nu star (bias corrected)	87.84
MLE Mean (bias corrected)	73436	MLE Sd (bias corrected)	41461
		Approximate Chi Square Value (0.05)	67.23
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	64.84

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	95944	95% Adjusted Gamma UCL (use when n<50)	99478

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.898	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.181	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	10.31	Mean of logged Data	11.07
Maximum of Logged Data	11.9	SD of logged Data	0.549

Assuming Lognormal Distribution

95% H-UCL	102656	90% Chebyshev (MVUE) UCL	107458
95% Chebyshev (MVUE) UCL	122668	97.5% Chebyshev (MVUE) UCL	143780
99% Chebyshev (MVUE) UCL	185251		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	90059	95% Jackknife UCL	91333
95% Standard Bootstrap UCL	89027	95% Bootstrap-t UCL	93956
95% Hall's Bootstrap UCL	93959	95% Percentile Bootstrap UCL	89921
95% BCA Bootstrap UCL	91136		
90% Chebyshev(Mean, Sd) UCL	103755	95% Chebyshev(Mean, Sd) UCL	117488
97.5% Chebyshev(Mean, Sd) UCL	136549	99% Chebyshev(Mean, Sd) UCL	173992

Suggested UCL to Use

95% Student's-t UCL	91333

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (aluminum)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
Number of Detects	12	Number of Non-Detects	2
Number of Distinct Detects	12	Number of Distinct Non-Detects	1
Minimum Detect	10	Minimum Non-Detect	9.6
Maximum Detect	600	Maximum Non-Detect	9.6
Variance Detects	27532	Percent Non-Detects	14.29%
Mean Detects	111.8	SD Detects	165.9
Median Detects	57	CV Detects	1.485
Skewness Detects	2.712	Kurtosis Detects	7.887
Mean of Logged Detects	4.031	SD of Logged Detects	1.171

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.62	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.347	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	97.16	KM Standard Error of Mean	42.25
KM SD	151.4	95% KM (BCA) UCL	172.8
95% KM (t) UCL	172	95% KM (Percentile Bootstrap) UCL	170
95% KM (z) UCL	166.7	95% KM Bootstrap t UCL	312.3
90% KM Chebyshev UCL	223.9	95% KM Chebyshev UCL	281.3
97.5% KM Chebyshev UCL	361	99% KM Chebyshev UCL	517.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.607	Anderson-Darling GOF Test
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.256	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.254	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.858	k star (bias corrected MLE)	0.699
Theta hat (MLE)	130.2	Theta star (bias corrected MLE)	159.9
nu hat (MLE)	20.59	nu star (bias corrected)	16.78
Mean (detects)	111.8		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	95.79
Maximum	600	Median	42
SD	157.9	CV	1.649
k hat (MLE)	0.376	k star (bias corrected MLE)	0.343
Theta hat (MLE)	254.4	Theta star (bias corrected MLE)	278.9

nu hat (MLE)	10.54	nu star (bias corrected)	9.616
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (9.62, α)	3.703	Adjusted Chi Square Value (9.62, β)	3.231
95% Gamma Approximate UCL (use when n>=50)	248.7	95% Gamma Adjusted UCL (use when n<50)	285

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	97.16	SD (KM)	151.4
Variance (KM)	22910	SE of Mean (KM)	42.25
k hat (KM)	0.412	k star (KM)	0.371
nu hat (KM)	11.54	nu star (KM)	10.4
theta hat (KM)	235.8	theta star (KM)	261.6
80% gamma percentile (KM)	155.3	90% gamma percentile (KM)	277.9
95% gamma percentile (KM)	414.1	99% gamma percentile (KM)	759.3

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (10.40, α)	4.192	Adjusted Chi Square Value (10.40, β)	3.684
95% Gamma Approximate KM-UCL (use when n>=50)	241	95% Gamma Adjusted KM-UCL (use when n<50)	274.3

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.965	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.172	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	96.29	Mean in Log Scale	3.63
SD in Original Scale	157.6	SD in Log Scale	1.487
95% t UCL (assumes normality of ROS data)	170.9	95% Percentile Bootstrap UCL	168.4
95% BCA Bootstrap UCL	212.9	95% Bootstrap t UCL	312.2
95% H-UCL (Log ROS)	517.1		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	3.778	KM Geo Mean	43.73
KM SD (logged)	1.209	95% Critical H Value (KM-Log)	3.151
KM Standard Error of Mean (logged)	0.337	95% H-UCL (KM -Log)	261.2
KM SD (logged)	1.209	95% Critical H Value (KM-Log)	3.151
KM Standard Error of Mean (logged)	0.337		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	96.47	Mean in Log Scale	3.679
SD in Original Scale	157.5	SD in Log Scale	1.4
95% t UCL (Assumes normality)	171	95% H-Stat UCL	411.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	312.3	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1	274.3

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (antimony_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	11
Number of Detects	11	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	0.6	Minimum Non-Detect	0.5
Maximum Detect	3.2	Maximum Non-Detect	0.5
Variance Detects	0.536	Percent Non-Detects	21.43%
Mean Detects	1.279	SD Detects	0.732
Median Detects	1	CV Detects	0.572
Skewness Detects	2.117	Kurtosis Detects	4.814
Mean of Logged Detects	0.137	SD of Logged Detects	0.457

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.737	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	Lilliefors GOF Test
5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.112	KM Standard Error of Mean	0.195
KM SD	0.697	95% KM (BCA) UCL	1.461
95% KM (t) UCL	1.458	95% KM (Percentile Bootstrap) UCL	1.425
95% KM (z) UCL	1.433	95% KM Bootstrap t UCL	1.756
90% KM Chebyshev UCL	1.698	95% KM Chebyshev UCL	1.963
97.5% KM Chebyshev UCL	2.331	99% KM Chebyshev UCL	3.055

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.874	Anderson-Darling GOF Test
5% A-D Critical Value	0.732	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.293	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.256	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.748	k star (bias corrected MLE)	3.514
Theta hat (MLE)	0.269	Theta star (bias corrected MLE)	0.364
nu hat (MLE)	104.5	nu star (bias corrected)	77.3
Mean (detects)	1.279		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.018
Maximum	3.2	Median	0.96
SD	0.826	CV	0.811
k hat (MLE)	0.871	k star (bias corrected MLE)	0.732
Theta hat (MLE)	1.169	Theta star (bias corrected MLE)	1.391
nu hat (MLE)	24.4	nu star (bias corrected)	20.5
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (20.50, α)	11.22	Adjusted Chi Square Value (20.50, β)	10.32
95% Gamma Approximate UCL (use when n>=50)	1.86	95% Gamma Adjusted UCL (use when n<50)	2.023

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.112	SD (KM)	0.697
Variance (KM)	0.485	SE of Mean (KM)	0.195
k hat (KM)	2.55	k star (KM)	2.051
nu hat (KM)	71.39	nu star (KM)	57.42
theta hat (KM)	0.436	theta star (KM)	0.542
80% gamma percentile (KM)	1.66	90% gamma percentile (KM)	2.15
95% gamma percentile (KM)	2.617	99% gamma percentile (KM)	3.651

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (57.42, α)	41.01	Adjusted Chi Square Value (57.42, β)	39.17
95% Gamma Approximate KM-UCL (use when n>=50)	1.557	95% Gamma Adjusted KM-UCL (use when n<50)	1.63

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.883	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.264	Lilliefors GOF Test
5% Lilliefors Critical Value	0.251	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.091	Mean in Log Scale	-0.0912
SD in Original Scale	0.744	SD in Log Scale	0.611
95% t UCL (assumes normality of ROS data)	1.443	95% Percentile Bootstrap UCL	1.421
95% BCA Bootstrap UCL	1.505	95% Bootstrap t UCL	1.698
95% H-UCL (Log ROS)	1.604		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.0408	KM Geo Mean	0.96
KM SD (logged)	0.515	95% Critical H Value (KM-Log)	2.027
KM Standard Error of Mean (logged)	0.144	95% H-UCL (KM -Log)	1.465
KM SD (logged)	0.515	95% Critical H Value (KM-Log)	2.027
KM Standard Error of Mean (logged)	0.144		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.059	Mean in Log Scale	-0.189
SD in Original Scale	0.777	SD in Log Scale	0.763
95% t UCL (Assumes normality)	1.427	95% H-Stat UCL	1.849

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM Student's t	1.348	KM H-UCL	1.465

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (arsenic)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	11
Number of Detects	9	Number of Non-Detects	5
Number of Distinct Detects	9	Number of Distinct Non-Detects	2
Minimum Detect	0.52	Minimum Non-Detect	0.5
Maximum Detect	4.7	Maximum Non-Detect	1.8
Variance Detects	1.966	Percent Non-Detects	35.71%
Mean Detects	1.431	SD Detects	1.402
Median Detects	0.8	CV Detects	0.98
Skewness Detects	1.994	Kurtosis Detects	3.677
Mean of Logged Detects	0.0506	SD of Logged Detects	0.766

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.705	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.315	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.111	KM Standard Error of Mean	0.326
KM SD	1.146	95% KM (BCA) UCL	1.771
95% KM (t) UCL	1.688	95% KM (Percentile Bootstrap) UCL	1.649
95% KM (z) UCL	1.647	95% KM Bootstrap t UCL	3.324
90% KM Chebyshev UCL	2.088	95% KM Chebyshev UCL	2.53
97.5% KM Chebyshev UCL	3.144	99% KM Chebyshev UCL	4.351

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.777	Anderson-Darling GOF Test
5% A-D Critical Value	0.732	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.242	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.773	k star (bias corrected MLE)	1.256
Theta hat (MLE)	0.807	Theta star (bias corrected MLE)	1.14
nu hat (MLE)	31.91	nu star (bias corrected)	22.61
Mean (detects)	1.431		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.936
Maximum	4.7	Median	0.55
SD	1.299	CV	1.387
k hat (MLE)	0.478	k star (bias corrected MLE)	0.423
Theta hat (MLE)	1.958	Theta star (bias corrected MLE)	2.211
nu hat (MLE)	13.39	nu star (bias corrected)	11.85
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (11.85, α)	5.131	Adjusted Chi Square Value (11.85, β)	4.558
95% Gamma Approximate UCL (use when n>=50)	2.163	95% Gamma Adjusted UCL (use when n<50)	2.435

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.111	SD (KM)	1.146
Variance (KM)	1.314	SE of Mean (KM)	0.326
k hat (KM)	0.94	k star (KM)	0.786
nu hat (KM)	26.32	nu star (KM)	22.02
theta hat (KM)	1.182	theta star (KM)	1.414
80% gamma percentile (KM)	1.818	90% gamma percentile (KM)	2.714
95% gamma percentile (KM)	3.628	99% gamma percentile (KM)	5.789

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (22.02, α)	12.35	Adjusted Chi Square Value (22.02, β)	11.4
95% Gamma Approximate KM-UCL (use when n>=50)	1.981	95% Gamma Adjusted KM-UCL (use when n<50)	2.147

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.861	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.195	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.007	Mean in Log Scale	-0.52
SD in Original Scale	1.251	SD in Log Scale	1.047
95% t UCL (assumes normality of ROS data)	1.599	95% Percentile Bootstrap UCL	1.577
95% BCA Bootstrap UCL	1.825	95% Bootstrap t UCL	2.761
95% H-UCL (Log ROS)	2.367		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.197	KM Geo Mean	0.821
KM SD (logged)	0.676	95% Critical H Value (KM-Log)	2.311
KM Standard Error of Mean (logged)	0.193	95% H-UCL (KM -Log)	1.591
KM SD (logged)	0.676	95% Critical H Value (KM-Log)	2.311
KM Standard Error of Mean (logged)	0.193		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.056	Mean in Log Scale	-0.371
SD in Original Scale	1.228	SD in Log Scale	0.898
95% t UCL (Assumes normality)	1.637	95% H-Stat UCL	1.988

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	2.147	95% GROS Adjusted Gamma UCL	2.435

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (barium)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	8.1	Mean	73.79
Maximum	270	Median	58.5
SD	77.46	Std. Error of Mean	20.7
Coefficient of Variation	1.05	Skewness	1.87

Normal GOF Test

Shapiro Wilk Test Statistic	0.742	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.295	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	110.5	95% Adjusted-CLT UCL (Chen-1995)	118.9
		95% Modified-t UCL (Johnson-1978)	112.2

Gamma GOF Test

A-D Test Statistic	0.46	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.755	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.175	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.234	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.243	k star (bias corrected MLE)	1.024
Theta hat (MLE)	59.38	Theta star (bias corrected MLE)	72.06
nu hat (MLE)	34.8	nu star (bias corrected)	28.67
MLE Mean (bias corrected)	73.79	MLE Sd (bias corrected)	72.92
		Approximate Chi Square Value (0.05)	17.45
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	16.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	121.2	95% Adjusted Gamma UCL (use when n<50)	129.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.134	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.092	Mean of logged Data	3.848
Maximum of Logged Data	5.598	SD of logged Data	1.01

Assuming Lognormal Distribution

95% H-UCL	171.4	90% Chebyshev (MVUE) UCL	139.6
95% Chebyshev (MVUE) UCL	169.1	97.5% Chebyshev (MVUE) UCL	210.2
99% Chebyshev (MVUE) UCL	290.9		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	107.8	95% Jackknife UCL	110.5
95% Standard Bootstrap UCL	107.3	95% Bootstrap-t UCL	161.4
95% Hall's Bootstrap UCL	321.9	95% Percentile Bootstrap UCL	109.1
95% BCA Bootstrap UCL	120.2		
90% Chebyshev(Mean, Sd) UCL	135.9	95% Chebyshev(Mean, Sd) UCL	164
97.5% Chebyshev(Mean, Sd) UCL	203.1	99% Chebyshev(Mean, Sd) UCL	279.8

Suggested UCL to Use

95% Adjusted Gamma UCL	129.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (barium_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	7.9	Mean	59.71
Maximum	180	Median	48.5
SD	50.91	Std. Error of Mean	13.61
Coefficient of Variation	0.853	Skewness	1.396

Normal GOF Test

Shapiro Wilk Test Statistic	0.844	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.198	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	83.8	95% Adjusted-CLT UCL (Chen-1995)	87.51
		95% Modified-t UCL (Johnson-1978)	84.65

Gamma GOF Test

A-D Test Statistic	0.306	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.233	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.571	k star (bias corrected MLE)	1.282
Theta hat (MLE)	38.01	Theta star (bias corrected MLE)	46.58
nu hat (MLE)	43.98	nu star (bias corrected)	35.89
MLE Mean (bias corrected)	59.71	MLE Sd (bias corrected)	52.74
		Approximate Chi Square Value (0.05)	23.18
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	21.83

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	92.45	95% Adjusted Gamma UCL (use when n<50)	98.16

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.182	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.067	Mean of logged Data	3.739
Maximum of Logged Data	5.193	SD of logged Data	0.913

Assuming Lognormal Distribution

95% H-UCL	124.9	90% Chebyshev (MVUE) UCL	109.7
95% Chebyshev (MVUE) UCL	131.5	97.5% Chebyshev (MVUE) UCL	161.9
99% Chebyshev (MVUE) UCL	221.6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	82.09	95% Jackknife UCL	83.8
95% Standard Bootstrap UCL	81.16	95% Bootstrap-t UCL	98.64
95% Hall's Bootstrap UCL	135.5	95% Percentile Bootstrap UCL	82.5
95% BCA Bootstrap UCL	88.14		
90% Chebyshev(Mean, Sd) UCL	100.5	95% Chebyshev(Mean, Sd) UCL	119
97.5% Chebyshev(Mean, Sd) UCL	144.7	99% Chebyshev(Mean, Sd) UCL	195.1

Suggested UCL to Use

95% Student's-t UCL	83.8

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (benzene)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	18
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.33	Minimum Non-Detect	0.09
Maximum Detect	2.4	Maximum Non-Detect	0.24
Variance Detects	0.62	Percent Non-Detects	75%
Mean Detects	0.832	SD Detects	0.787
Median Detects	0.59	CV Detects	0.947
Skewness Detects	2.193	Kurtosis Detects	5.024
Mean of Logged Detects	-0.451	SD of Logged Detects	0.735

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.691	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.375	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.275	KM Standard Error of Mean	0.108
KM SD	0.482	95% KM (BCA) UCL	0.492
95% KM (t) UCL	0.46	95% KM (Percentile Bootstrap) UCL	0.475
95% KM (z) UCL	0.453	95% KM Bootstrap t UCL	0.592
90% KM Chebyshev UCL	0.599	95% KM Chebyshev UCL	0.745
97.5% KM Chebyshev UCL	0.948	99% KM Chebyshev UCL	1.348

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.595	Anderson-Darling GOF Test
5% A-D Critical Value	0.704	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.296	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.336	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.029	k star (bias corrected MLE)	1.126
Theta hat (MLE)	0.41	Theta star (bias corrected MLE)	0.739
nu hat (MLE)	24.35	nu star (bias corrected)	13.51
Mean (detects)	0.832		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.215
Maximum	2.4	Median	0.01
SD	0.517	CV	2.398
k hat (MLE)	0.334	k star (bias corrected MLE)	0.32
Theta hat (MLE)	0.646	Theta star (bias corrected MLE)	0.674
nu hat (MLE)	16.01	nu star (bias corrected)	15.35
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (15.35, α)	7.503	Adjusted Chi Square Value (15.35, β)	7.118
95% Gamma Approximate UCL (use when n>=50)	0.441	95% Gamma Adjusted UCL (use when n<50)	0.464

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.275	SD (KM)	0.482
Variance (KM)	0.232	SE of Mean (KM)	0.108
k hat (KM)	0.327	k star (KM)	0.314
nu hat (KM)	15.68	nu star (KM)	15.05
theta hat (KM)	0.843	theta star (KM)	0.878
80% gamma percentile (KM)	0.427	90% gamma percentile (KM)	0.808
95% gamma percentile (KM)	1.242	99% gamma percentile (KM)	2.364

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (15.05, α)	7.296	Adjusted Chi Square Value (15.05, β)	6.918
95% Gamma Approximate KM-UCL (use when n>=50)	0.568	95% Gamma Adjusted KM-UCL (use when n<50)	0.599

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.866	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.246	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.245	Mean in Log Scale	-2.723
SD in Original Scale	0.506	SD in Log Scale	1.674
95% t UCL (assumes normality of ROS data)	0.422	95% Percentile Bootstrap UCL	0.431
95% BCA Bootstrap UCL	0.525	95% Bootstrap t UCL	0.702
95% H-UCL (Log ROS)	0.922		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.919	KM Geo Mean	0.147
KM SD (logged)	0.912	95% Critical H Value (KM-Log)	2.428
KM Standard Error of Mean (logged)	0.204	95% H-UCL (KM -Log)	0.353
KM SD (logged)	0.912	95% Critical H Value (KM-Log)	2.428
KM Standard Error of Mean (logged)	0.204		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.282	Mean in Log Scale	-1.876
SD in Original Scale	0.49	SD in Log Scale	0.94
95% t UCL (Assumes normality)	0.453	95% H-Stat UCL	0.386

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	0.599	95% GROS Adjusted Gamma UCL	0.464

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (calcium)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	8700	Mean	24679
Maximum	49400	Median	25700
SD	12893	Std. Error of Mean	3446
Coefficient of Variation	0.522	Skewness	0.628

Normal GOF Test

Shapiro Wilk Test Statistic	0.874	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.214	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	30781	95% Adjusted-CLT UCL (Chen-1995)	30964
		95% Modified-t UCL (Johnson-1978)	30877

Gamma GOF Test

A-D Test Statistic	0.776	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.216	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.67	k star (bias corrected MLE)	2.931
Theta hat (MLE)	6725	Theta star (bias corrected MLE)	8420
nu hat (MLE)	102.8	nu star (bias corrected)	82.07
MLE Mean (bias corrected)	24679	MLE Sd (bias corrected)	14415
		Approximate Chi Square Value (0.05)	62.19
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	59.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32566	95% Adjusted Gamma UCL (use when n<50)	33812

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.869	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.243	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.071	Mean of logged Data	9.971
Maximum of Logged Data	10.81	SD of logged Data	0.579

Assuming Lognormal Distribution

95% H-UCL	35746	90% Chebyshev (MVUE) UCL	36983
95% Chebyshev (MVUE) UCL	42425	97.5% Chebyshev (MVUE) UCL	49979
99% Chebyshev (MVUE) UCL	64816		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	30347	95% Jackknife UCL	30781
95% Standard Bootstrap UCL	30080	95% Bootstrap-t UCL	32069
95% Hall's Bootstrap UCL	33155	95% Percentile Bootstrap UCL	30507
95% BCA Bootstrap UCL	30836		
90% Chebyshev(Mean, Sd) UCL	35016	95% Chebyshev(Mean, Sd) UCL	39699
97.5% Chebyshev(Mean, Sd) UCL	46198	99% Chebyshev(Mean, Sd) UCL	58964

Suggested UCL to Use

95% Student's-t UCL 30781

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (calcium_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	8400	Mean	23450
Maximum	49300	Median	23950
SD	12735	Std. Error of Mean	3403
Coefficient of Variation	0.543	Skewness	0.798

Normal GOF Test

Shapiro Wilk Test Statistic	0.871	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	29477	95% Adjusted-CLT UCL (Chen-1995)	29823

95% Modified-t UCL (Johnson-1978)	29598

Gamma GOF Test

A-D Test Statistic	0.686	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.539	k star (bias corrected MLE)	2.828
Theta hat (MLE)	6626	Theta star (bias corrected MLE)	8292
nu hat (MLE)	99.09	nu star (bias corrected)	79.19
MLE Mean (bias corrected)	23450	MLE Sd (bias corrected)	13944
		Approximate Chi Square Value (0.05)	59.69
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	57.44

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	31112	95% Adjusted Gamma UCL (use when n<50)	32327

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.883	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.203	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.036	Mean of logged Data	9.915
Maximum of Logged Data	10.81	SD of logged Data	0.585

Assuming Lognormal Distribution

95% H-UCL	34126	90% Chebyshev (MVUE) UCL	35202
95% Chebyshev (MVUE) UCL	40423	97.5% Chebyshev (MVUE) UCL	47669
99% Chebyshev (MVUE) UCL	61903		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	29048	95% Jackknife UCL	29477
95% Standard Bootstrap UCL	28659	95% Bootstrap-t UCL	30902
95% Hall's Bootstrap UCL	33742	95% Percentile Bootstrap UCL	28914
95% BCA Bootstrap UCL	29564		
90% Chebyshev(Mean, Sd) UCL	33660	95% Chebyshev(Mean, Sd) UCL	38285
97.5% Chebyshev(Mean, Sd) UCL	44705	99% Chebyshev(Mean, Sd) UCL	57314

Suggested UCL to Use

95% Adjusted Gamma UCL	32327

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (chloride)

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	1070	Mean	18326
Maximum	126000	Median	1975
SD	39353	Std. Error of Mean	8800
Coefficient of Variation	2.147	Skewness	2.23

Normal GOF Test

Shapiro Wilk Test Statistic	0.483	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.449	Lilliefors GOF Test
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	33542	95% Adjusted-CLT UCL (Chen-1995)	37488
		95% Modified-t UCL (Johnson-1978)	34273

Gamma GOF Test

A-D Test Statistic	3.8	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.821	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.385	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.207	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.413	k star (bias corrected MLE)	0.384
Theta hat (MLE)	44396	Theta star (bias corrected MLE)	47699
nu hat (MLE)	16.51	nu star (bias corrected)	15.37
MLE Mean (bias corrected)	18326	MLE Sd (bias corrected)	29566
		Approximate Chi Square Value (0.05)	7.518
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	7.087

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	37460	95% Adjusted Gamma UCL (use when n<50)	39742

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.705	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.271	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.975	Mean of logged Data	8.23
Maximum of Logged Data	11.74	SD of logged Data	1.527

Assuming Lognormal Distribution

95% H-UCL	40664	90% Chebyshev (MVUE) UCL	24033
95% Chebyshev (MVUE) UCL	30033	97.5% Chebyshev (MVUE) UCL	38362
99% Chebyshev (MVUE) UCL	54722		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	32800	95% Jackknife UCL	33542
95% Standard Bootstrap UCL	31960	95% Bootstrap-t UCL	42884
95% Hall's Bootstrap UCL	28503	95% Percentile Bootstrap UCL	34108
95% BCA Bootstrap UCL	38111		
90% Chebyshev(Mean, Sd) UCL	44725	95% Chebyshev(Mean, Sd) UCL	56683
97.5% Chebyshev(Mean, Sd) UCL	73280	99% Chebyshev(Mean, Sd) UCL	105881

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 56683

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (chloroethane)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	9
Number of Detects	6	Number of Non-Detects	18
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	0.83	Minimum Non-Detect	0.34
Maximum Detect	11	Maximum Non-Detect	0.37
Variance Detects	14.41	Percent Non-Detects	75%
Mean Detects	3.538	SD Detects	3.796
Median Detects	2.3	CV Detects	1.073
Skewness Detects	2.068	Kurtosis Detects	4.514
Mean of Logged Detects	0.882	SD of Logged Detects	0.916

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.74	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.14	KM Standard Error of Mean	0.496
KM SD	2.218	95% KM (BCA) UCL	2.051
95% KM (t) UCL	1.99	95% KM (Percentile Bootstrap) UCL	1.983
95% KM (z) UCL	1.955	95% KM Bootstrap t UCL	2.908
90% KM Chebyshev UCL	2.628	95% KM Chebyshev UCL	3.302
97.5% KM Chebyshev UCL	4.237	99% KM Chebyshev UCL	6.075

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.364	Anderson-Darling GOF Test

5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.215	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.338	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.454	k star (bias corrected MLE)	0.838
Theta hat (MLE)	2.433	Theta star (bias corrected MLE)	4.221
nu hat (MLE)	17.45	nu star (bias corrected)	10.06
Mean (detects)	3.538		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.892
Maximum	11	Median	0.01
SD	2.36	CV	2.645
k hat (MLE)	0.231	k star (bias corrected MLE)	0.23
Theta hat (MLE)	3.867	Theta star (bias corrected MLE)	3.885
nu hat (MLE)	11.07	nu star (bias corrected)	11.02
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (11.02, α)	4.59	Adjusted Chi Square Value (11.02, β)	4.301
95% Gamma Approximate UCL (use when n>=50)	2.142	95% Gamma Adjusted UCL (use when n<50)	2.286

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.14	SD (KM)	2.218
Variance (KM)	4.92	SE of Mean (KM)	0.496
k hat (KM)	0.264	k star (KM)	0.259
nu hat (KM)	12.67	nu star (KM)	12.42
theta hat (KM)	4.317	theta star (KM)	4.404
80% gamma percentile (KM)	1.675	90% gamma percentile (KM)	3.412
95% gamma percentile (KM)	5.46	99% gamma percentile (KM)	10.89

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (12.42, α)	5.504	Adjusted Chi Square Value (12.42, β)	5.183
95% Gamma Approximate KM-UCL (use when n>=50)	2.571	95% Gamma Adjusted KM-UCL (use when n<50)	2.731

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.165	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.962	Mean in Log Scale	-2.024
SD in Original Scale	2.335	SD in Log Scale	2.139
95% t UCL (assumes normality of ROS data)	1.779	95% Percentile Bootstrap UCL	1.826
95% BCA Bootstrap UCL	2.372	95% Bootstrap t UCL	3.299
95% H-UCL (Log ROS)	8.945		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.589	KM Geo Mean	0.555
KM SD (logged)	0.946	95% Critical H Value (KM-Log)	2.472
KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	1.415
KM SD (logged)	0.946	95% Critical H Value (KM-Log)	2.472
KM Standard Error of Mean (logged)	0.212		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.018	Mean in Log Scale	-1.073
SD in Original Scale	2.311	SD in Log Scale	1.23
95% t UCL (Assumes normality)	1.827	95% H-Stat UCL	1.518

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	2.731

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (cobalt)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	8
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.55	Minimum Non-Detect	0.5
Maximum Detect	3.4	Maximum Non-Detect	0.5
Variance Detects	1.267	Percent Non-Detects	57.14%
Mean Detects	1.473	SD Detects	1.126
Median Detects	1	CV Detects	0.764
Skewness Detects	1.22	Kurtosis Detects	0.519
Mean of Logged Detects	0.158	SD of Logged Detects	0.729

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.842	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.254	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.917	KM Standard Error of Mean	0.242
KM SD	0.827	95% KM (BCA) UCL	1.389
95% KM (t) UCL	1.346	95% KM (Percentile Bootstrap) UCL	1.296
95% KM (z) UCL	1.316	95% KM Bootstrap t UCL	2.109
90% KM Chebyshev UCL	1.644	95% KM Chebyshev UCL	1.973
97.5% KM Chebyshev UCL	2.43	99% KM Chebyshev UCL	3.327

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.421	Anderson-Darling GOF Test	
5% A-D Critical Value	0.703	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.283	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.333	k star (bias corrected MLE)	1.278
Theta hat (MLE)	0.631	Theta star (bias corrected MLE)	1.153
nu hat (MLE)	28	nu star (bias corrected)	15.33
Mean (detects)	1.473		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.637
Maximum	3.4	Median	0.01
SD	1.026	CV	1.61
k hat (MLE)	0.323	k star (bias corrected MLE)	0.301
Theta hat (MLE)	1.976	Theta star (bias corrected MLE)	2.117
nu hat (MLE)	9.03	nu star (bias corrected)	8.429
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (8.43, α)	2.986	Adjusted Chi Square Value (8.43, β)	2.572
95% Gamma Approximate UCL (use when n>=50)	1.799	95% Gamma Adjusted UCL (use when n<50)	2.088

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.917	SD (KM)	0.827
Variance (KM)	0.684	SE of Mean (KM)	0.242
k hat (KM)	1.229	k star (KM)	1.013
nu hat (KM)	34.41	nu star (KM)	28.37
theta hat (KM)	0.746	theta star (KM)	0.905
80% gamma percentile (KM)	1.475	90% gamma percentile (KM)	2.105
95% gamma percentile (KM)	2.735	99% gamma percentile (KM)	4.196

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (28.37, α)	17.22	Adjusted Chi Square Value (28.37, β)	16.07
95% Gamma Approximate KM-UCL (use when n>=50)	1.511	95% Gamma Adjusted KM-UCL (use when n<50)	1.619

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.904	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.26	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.71	Mean in Log Scale	-1.221
SD in Original Scale	0.981	SD in Log Scale	1.458
95% t UCL (assumes normality of ROS data)	1.174	95% Percentile Bootstrap UCL	1.169
95% BCA Bootstrap UCL	1.287	95% Bootstrap t UCL	1.728

95% H-UCL (Log ROS)	3.674		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.328	KM Geo Mean	0.72
KM SD (logged)	0.606	95% Critical H Value (KM-Log)	2.216
KM Standard Error of Mean (logged)	0.177	95% H-UCL (KM -Log)	1.256
KM SD (logged)	0.606	95% Critical H Value (KM-Log)	2.216
KM Standard Error of Mean (logged)	0.177		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.774	Mean in Log Scale	-0.724
SD in Original Scale	0.939	SD in Log Scale	0.913
95% t UCL (Assumes normality)	1.219	95% H-Stat UCL	1.439

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.346

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (copper)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	8
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.56	Minimum Non-Detect	0.5
Maximum Detect	6.1	Maximum Non-Detect	0.5
Variance Detects	4.549	Percent Non-Detects	57.14%
Mean Detects	1.82	SD Detects	2.133
Median Detects	1.025	CV Detects	1.172
Skewness Detects	2.272	Kurtosis Detects	5.295
Mean of Logged Detects	0.204	SD of Logged Detects	0.881

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.659	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.374	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.066	KM Standard Error of Mean	0.419
KM SD	1.432	95% KM (BCA) UCL	1.799
95% KM (t) UCL	1.808	95% KM (Percentile Bootstrap) UCL	1.829
95% KM (z) UCL	1.755	95% KM Bootstrap t UCL	4.129
90% KM Chebyshev UCL	2.324	95% KM Chebyshev UCL	2.893

97.5% KM Chebyshev UCL	3.684	99% KM Chebyshev UCL	5.238

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.637	Anderson-Darling GOF Test	
5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.279	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.338	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.41	k star (bias corrected MLE)	0.816
Theta hat (MLE)	1.291	Theta star (bias corrected MLE)	2.23
nu hat (MLE)	16.92	nu star (bias corrected)	9.792
Mean (detects)	1.82		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.786
Maximum	6.1	Median	0.01
SD	1.617	CV	2.058
k hat (MLE)	0.3	k star (bias corrected MLE)	0.283
Theta hat (MLE)	2.623	Theta star (bias corrected MLE)	2.777
nu hat (MLE)	8.386	nu star (bias corrected)	7.923
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (7.92, α)	2.69	Adjusted Chi Square Value (7.92, β)	2.303
95% Gamma Approximate UCL (use when n>=50)	2.314	95% Gamma Adjusted UCL (use when n<50)	2.703

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.066	SD (KM)	1.432
Variance (KM)	2.051	SE of Mean (KM)	0.419
k hat (KM)	0.554	k star (KM)	0.483
nu hat (KM)	15.5	nu star (KM)	13.51
theta hat (KM)	1.925	theta star (KM)	2.208
80% gamma percentile (KM)	1.747	90% gamma percentile (KM)	2.904
95% gamma percentile (KM)	4.146	99% gamma percentile (KM)	7.209

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (13.51, α)	6.24	Adjusted Chi Square Value (13.51, β)	5.597
95% Gamma Approximate KM-UCL (use when n>=50)	2.308	95% Gamma Adjusted KM-UCL (use when n<50)	2.573

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.869	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.215	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.837	Mean in Log Scale	-1.437
SD in Original Scale	1.592	SD in Log Scale	1.737

95% t UCL (assumes normality of ROS data)	1.591	95% Percentile Bootstrap UCL	1.61
95% BCA Bootstrap UCL	1.96	95% Bootstrap t UCL	3.181
95% H-UCL (Log ROS)	7.933		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.309	KM Geo Mean	0.734
KM SD (logged)	0.689	95% Critical H Value (KM-Log)	2.325
KM Standard Error of Mean (logged)	0.202	95% H-UCL (KM -Log)	1.451
KM SD (logged)	0.689	95% Critical H Value (KM-Log)	2.325
KM Standard Error of Mean (logged)	0.202		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.923	Mean in Log Scale	-0.705
SD in Original Scale	1.549	SD in Log Scale	0.983
95% t UCL (Assumes normality)	1.656	95% H-Stat UCL	1.701

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	4.129	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	2.573

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (copper_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	6
Number of Detects	6	Number of Non-Detects	8
Number of Distinct Detects	5	Number of Distinct Non-Detects	1
Minimum Detect	0.53	Minimum Non-Detect	0.5
Maximum Detect	1.5	Maximum Non-Detect	0.5
Variance Detects	0.143	Percent Non-Detects	57.14%
Mean Detects	0.933	SD Detects	0.378
Median Detects	0.77	CV Detects	0.405
Skewness Detects	0.828	Kurtosis Detects	-1.058
Mean of Logged Detects	-0.134	SD of Logged Detects	0.391

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.862	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.334	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.686	KM Standard Error of Mean	0.0911
KM SD	0.311	95% KM (BCA) UCL	0.834
95% KM (t) UCL	0.847	95% KM (Percentile Bootstrap) UCL	0.831

95% KM (z) UCL	0.836	95% KM Bootstrap t UCL	0.965
90% KM Chebyshev UCL	0.959	95% KM Chebyshev UCL	1.083
97.5% KM Chebyshev UCL	1.255	99% KM Chebyshev UCL	1.593

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.485	Anderson-Darling GOF Test
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.322	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	7.845	k star (bias corrected MLE)	4.033
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.231
nu hat (MLE)	94.14	nu star (bias corrected)	48.4
Mean (detects)	0.933		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.448
Maximum	1.5	Median	0.257
SD	0.502	CV	1.122
k hat (MLE)	0.504	k star (bias corrected MLE)	0.444
Theta hat (MLE)	0.887	Theta star (bias corrected MLE)	1.008
nu hat (MLE)	14.12	nu star (bias corrected)	12.43
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (12.43, α)	5.512	Adjusted Chi Square Value (12.43, β)	4.914
95% Gamma Approximate UCL (use when n>=50)	1.01	95% Gamma Adjusted UCL (use when n<50)	1.133

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.686	SD (KM)	0.311
Variance (KM)	0.0969	SE of Mean (KM)	0.0911
k hat (KM)	4.852	k star (KM)	3.86
nu hat (KM)	135.9	nu star (KM)	108.1
theta hat (KM)	0.141	theta star (KM)	0.178
80% gamma percentile (KM)	0.949	90% gamma percentile (KM)	1.154
95% gamma percentile (KM)	1.342	99% gamma percentile (KM)	1.745

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (108.08, α)	85.08	Adjusted Chi Square Value (108.08, β)	82.38
95% Gamma Approximate KM-UCL (use when n>=50)	0.871	95% Gamma Adjusted KM-UCL (use when n<50)	0.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.904	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.294	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.554	Mean in Log Scale	-0.853
SD in Original Scale	0.421	SD in Log Scale	0.762
95% t UCL (assumes normality of ROS data)	0.753	95% Percentile Bootstrap UCL	0.748
95% BCA Bootstrap UCL	0.764	95% Bootstrap t UCL	0.831
95% H-UCL (Log ROS)	0.951		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.454	KM Geo Mean	0.635
KM SD (logged)	0.362	95% Critical H Value (KM-Log)	1.948
KM Standard Error of Mean (logged)	0.106	95% H-UCL (KM -Log)	0.825
KM SD (logged)	0.362	95% Critical H Value (KM-Log)	1.948
KM Standard Error of Mean (logged)	0.106		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.543	Mean in Log Scale	-0.85
SD in Original Scale	0.422	SD in Log Scale	0.687
95% t UCL (Assumes normality)	0.743	95% H-Stat UCL	0.843

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.847

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (iron)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	170	Mean	11377
Maximum	74400	Median	3400
SD	21186	Std. Error of Mean	5662
Coefficient of Variation	1.862	Skewness	2.59

Normal GOF Test

Shapiro Wilk Test Statistic	0.561	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.407	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL　　95% UCLs (Adjusted for Skewness)

95% Student's-t UCL	21405	95% Adjusted-CLT UCL (Chen-1995)	24878
		95% Modified-t UCL (Johnson-1978)	22058

Gamma GOF Test

A-D Test Statistic	0.751	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.796	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.235	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.242	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.484	k star (bias corrected MLE)	0.428
Theta hat (MLE)	23508	Theta star (bias corrected MLE)	26590
nu hat (MLE)	13.55	nu star (bias corrected)	11.98
MLE Mean (bias corrected)	11377	MLE Sd (bias corrected)	17393
		Approximate Chi Square Value (0.05)	5.214
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	4.635

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	26141	95% Adjusted Gamma UCL (use when n<50)	29407

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.196	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.136	Mean of logged Data	8.02
Maximum of Logged Data	11.22	SD of logged Data	1.789

Assuming Lognormal Distribution

95% H-UCL	124112	90% Chebyshev (MVUE) UCL	31264
95% Chebyshev (MVUE) UCL	40032	97.5% Chebyshev (MVUE) UCL	52201
99% Chebyshev (MVUE) UCL	76106		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	20691	95% Jackknife UCL	21405
95% Standard Bootstrap UCL	20214	95% Bootstrap-t UCL	69852
95% Hall's Bootstrap UCL	72106	95% Percentile Bootstrap UCL	21805
95% BCA Bootstrap UCL	26001		
90% Chebyshev(Mean, Sd) UCL	28364	95% Chebyshev(Mean, Sd) UCL	36058
97.5% Chebyshev(Mean, Sd) UCL	46738	99% Chebyshev(Mean, Sd) UCL	67715

Suggested UCL to Use

95% Adjusted Gamma UCL	29407

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (iron_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
Number of Detects	13	Number of Non-Detects	1
Number of Distinct Detects	13	Number of Distinct Non-Detects	1
Minimum Detect	18	Minimum Non-Detect	10
Maximum Detect	840	Maximum Non-Detect	10
Variance Detects	101588	Percent Non-Detects	7.143%
Mean Detects	302.1	SD Detects	318.7
Median Detects	82	CV Detects	1.055
Skewness Detects	0.77	Kurtosis Detects	-1.134
Mean of Logged Detects	4.96	SD of Logged Detects	1.402

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.806	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.294	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	281.2	KM Standard Error of Mean	84.71
KM SD	304.5	95% KM (BCA) UCL	427.9
95% KM (t) UCL	431.2	95% KM (Percentile Bootstrap) UCL	412.8
95% KM (z) UCL	420.6	95% KM Bootstrap t UCL	468
90% KM Chebyshev UCL	535.3	95% KM Chebyshev UCL	650.5
97.5% KM Chebyshev UCL	810.2	99% KM Chebyshev UCL	1124

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.684	Anderson-Darling GOF Test
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.248	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.245	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.792	k star (bias corrected MLE)	0.66
Theta hat (MLE)	381.4	Theta star (bias corrected MLE)	457.4
nu hat (MLE)	20.59	nu star (bias corrected)	17.17
Mean (detects)	302.1		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	280.5
Maximum	840	Median	77.5
SD	316.7	CV	1.129
k hat (MLE)	0.471	k star (bias corrected MLE)	0.418

Theta hat (MLE)	594.9	Theta star (bias corrected MLE)	670.9
nu hat (MLE)	13.2	nu star (bias corrected)	11.71
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (11.71, α)	5.034	Adjusted Chi Square Value (11.71, β)	4.467
95% Gamma Approximate UCL (use when n>=50)	652.3	95% Gamma Adjusted UCL (use when n<50)	735.1

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	281.2	SD (KM)	304.5
Variance (KM)	92734	SE of Mean (KM)	84.71
k hat (KM)	0.853	k star (KM)	0.718
nu hat (KM)	23.88	nu star (KM)	20.09
theta hat (KM)	329.8	theta star (KM)	391.8
80% gamma percentile (KM)	461.9	90% gamma percentile (KM)	701.8
95% gamma percentile (KM)	948.6	99% gamma percentile (KM)	1537

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (20.09, α)	10.92	Adjusted Chi Square Value (20.09, β)	10.03
95% Gamma Approximate KM-UCL (use when n>=50)	517.4	95% Gamma Adjusted KM-UCL (use when n<50)	563.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.897	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.192	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	280.8	Mean in Log Scale	4.719
SD in Original Scale	316.4	SD in Log Scale	1.621
95% t UCL (assumes normality of ROS data)	430.6	95% Percentile Bootstrap UCL	419.4
95% BCA Bootstrap UCL	427.1	95% Bootstrap t UCL	466.9
95% H-UCL (Log ROS)	2433		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	4.77	KM Geo Mean	118
KM SD (logged)	1.468	95% Critical H Value (KM-Log)	3.629
KM Standard Error of Mean (logged)	0.408	95% H-UCL (KM -Log)	1517
KM SD (logged)	1.468	95% Critical H Value (KM-Log)	3.629
KM Standard Error of Mean (logged)	0.408		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	280.9	Mean in Log Scale	4.721
SD in Original Scale	316.4	SD in Log Scale	1.618
95% t UCL (Assumes normality)	430.6	95% H-Stat UCL	2409

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	468	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	563.2

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (lead)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	10
Number of Detects	10	Number of Non-Detects	4
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.28	Minimum Non-Detect	0.2
Maximum Detect	4.3	Maximum Non-Detect	0.2
Variance Detects	1.455	Percent Non-Detects	28.57%
Mean Detects	0.975	SD Detects	1.206
Median Detects	0.595	CV Detects	1.237
Skewness Detects	2.812	Kurtosis Detects	8.338
Mean of Logged Detects	-0.42	SD of Logged Detects	0.835

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.591	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.754	KM Standard Error of Mean	0.29
KM SD	1.029	95% KM (BCA) UCL	1.341
95% KM (t) UCL	1.267	95% KM (Percentile Bootstrap) UCL	1.263
95% KM (z) UCL	1.23	95% KM Bootstrap t UCL	2.236
90% KM Chebyshev UCL	1.623	95% KM Chebyshev UCL	2.017
97.5% KM Chebyshev UCL	2.563	99% KM Chebyshev UCL	3.637

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.791	Anderson-Darling GOF Test
5% A-D Critical Value	0.741	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.272	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.41	k star (bias corrected MLE)	1.054
Theta hat (MLE)	0.691	Theta star (bias corrected MLE)	0.925
nu hat (MLE)	28.2	nu star (bias corrected)	21.08
Mean (detects)	0.975		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.699
Maximum	4.3	Median	0.39
SD	1.101	CV	1.574
k hat (MLE)	0.504	k star (bias corrected MLE)	0.444
Theta hat (MLE)	1.387	Theta star (bias corrected MLE)	1.576
nu hat (MLE)	14.12	nu star (bias corrected)	12.43
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (12.43, α)	5.509	Adjusted Chi Square Value (12.43, β)	4.911
95% Gamma Approximate UCL (use when n>=50)	1.577	95% Gamma Adjusted UCL (use when n<50)	1.769

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.754	SD (KM)	1.029
Variance (KM)	1.058	SE of Mean (KM)	0.29
k hat (KM)	0.537	k star (KM)	0.469
nu hat (KM)	15.03	nu star (KM)	13.14
theta hat (KM)	1.404	theta star (KM)	1.606
80% gamma percentile (KM)	1.234	90% gamma percentile (KM)	2.065
95% gamma percentile (KM)	2.961	99% gamma percentile (KM)	5.176

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (13.14, α)	5.987	Adjusted Chi Square Value (13.14, β)	5.359
95% Gamma Approximate KM-UCL (use when n>=50)	1.654	95% Gamma Adjusted KM-UCL (use when n<50)	1.848

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.884	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.723	Mean in Log Scale	-1.006
SD in Original Scale	1.086	SD in Log Scale	1.209
95% t UCL (assumes normality of ROS data)	1.237	95% Percentile Bootstrap UCL	1.251
95% BCA Bootstrap UCL	1.542	95% Bootstrap t UCL	2.124
95% H-UCL (Log ROS)	2.181		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.76	KM Geo Mean	0.468
KM SD (logged)	0.858	95% Critical H Value (KM-Log)	2.567
KM Standard Error of Mean (logged)	0.242	95% H-UCL (KM -Log)	1.246
KM SD (logged)	0.858	95% Critical H Value (KM-Log)	2.567
KM Standard Error of Mean (logged)	0.242		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.725	Mean in Log Scale	-0.958
SD in Original Scale	1.084	SD in Log Scale	1.123
95% t UCL (Assumes normality)	1.238	95% H-Stat UCL	1.836

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	1.848	95% GROS Adjusted Gamma UCL	1.769

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (magnesium)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	2200	Mean	5093
Maximum	12800	Median	4050
SD	3020	Std. Error of Mean	807.1
Coefficient of Variation	0.593	Skewness	1.638

Normal GOF Test

Shapiro Wilk Test Statistic	0.797	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.298	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	6522	95% Adjusted-CLT UCL (Chen-1995)	6798
		95% Modified-t UCL (Johnson-1978)	6581

Gamma GOF Test

A-D Test Statistic	0.694	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.234	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.23	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.01	k star (bias corrected MLE)	3.198
Theta hat (MLE)	1270	Theta star (bias corrected MLE)	1593
nu hat (MLE)	112.3	nu star (bias corrected)	89.54
MLE Mean (bias corrected)	5093	MLE Sd (bias corrected)	2848
		Approximate Chi Square Value (0.05)	68.73
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	66.31

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	6636	95% Adjusted Gamma UCL (use when n<50)	6877

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.929	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.198	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.696	Mean of logged Data	8.406
Maximum of Logged Data	9.457	SD of logged Data	0.504

Assuming Lognormal Distribution

95% H-UCL	6725	90% Chebyshev (MVUE) UCL	7114
95% Chebyshev (MVUE) UCL	8060	97.5% Chebyshev (MVUE) UCL	9372
99% Chebyshev (MVUE) UCL	11950		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6420	95% Jackknife UCL	6522
95% Standard Bootstrap UCL	6358	95% Bootstrap-t UCL	7217
95% Hall's Bootstrap UCL	6795	95% Percentile Bootstrap UCL	6493
95% BCA Bootstrap UCL	6779		
90% Chebyshev(Mean, Sd) UCL	7514	95% Chebyshev(Mean, Sd) UCL	8611
97.5% Chebyshev(Mean, Sd) UCL	10133	99% Chebyshev(Mean, Sd) UCL	13123

Suggested UCL to Use

95% Adjusted Gamma UCL	6877

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (magnesium_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	2100	Mean	5107
Maximum	13100	Median	3850
SD	3146	Std. Error of Mean	840.8
Coefficient of Variation	0.616	Skewness	1.659

Normal GOF Test

Shapiro Wilk Test Statistic	0.784	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.287	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	6596	95% Adjusted-CLT UCL (Chen-1995)	6888
		95% Modified-t UCL (Johnson-1978)	6658

Gamma GOF Test

A-D Test Statistic	0.803	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.218	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.781	k star (bias corrected MLE)	3.018
Theta hat (MLE)	1351	Theta star (bias corrected MLE)	1692
nu hat (MLE)	105.9	nu star (bias corrected)	84.51
MLE Mean (bias corrected)	5107	MLE Sd (bias corrected)	2940
		Approximate Chi Square Value (0.05)	64.32
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	61.99

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	6710	95% Adjusted Gamma UCL (use when n<50)	6963

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.919	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.65	Mean of logged Data	8.4
Maximum of Logged Data	9.48	SD of logged Data	0.517

Assuming Lognormal Distribution

95% H-UCL	6799	90% Chebyshev (MVUE) UCL	7177
95% Chebyshev (MVUE) UCL	8149	97.5% Chebyshev (MVUE) UCL	9498
99% Chebyshev (MVUE) UCL	12148		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6490	95% Jackknife UCL	6596
95% Standard Bootstrap UCL	6444	95% Bootstrap-t UCL	7597
95% Hall's Bootstrap UCL	6909	95% Percentile Bootstrap UCL	6464
95% BCA Bootstrap UCL	6907		
90% Chebyshev(Mean, Sd) UCL	7629	95% Chebyshev(Mean, Sd) UCL	8772
97.5% Chebyshev(Mean, Sd) UCL	10358	99% Chebyshev(Mean, Sd) UCL	13473

Suggested UCL to Use

95% Adjusted Gamma UCL	6963

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (manganese)

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	22	Mean	593.2
Maximum	1800	Median	560
SD	490	Std. Error of Mean	112.4
Coefficient of Variation	0.826	Skewness	0.844

Normal GOF Test

Shapiro Wilk Test Statistic	0.911	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.199	Lilliefors GOF Test
5% Lilliefors Critical Value	0.197	Data Not Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	788.1	95% Adjusted-CLT UCL (Chen-1995)	801.4
		95% Modified-t UCL (Johnson-1978)	791.8

Gamma GOF Test

A-D Test Statistic	0.342	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.765	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.203	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.187	k star (bias corrected MLE)	1.035
Theta hat (MLE)	499.7	Theta star (bias corrected MLE)	573.3
nu hat (MLE)	45.11	nu star (bias corrected)	39.32
MLE Mean (bias corrected)	593.2	MLE Sd (bias corrected)	583.1
		Approximate Chi Square Value (0.05)	25.96
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	25.01

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	898.6	95% Adjusted Gamma UCL (use when n<50)	932.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.166	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.197	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.091	Mean of logged Data	5.909
Maximum of Logged Data	7.496	SD of logged Data	1.176

Assuming Lognormal Distribution

95% H-UCL	1630	90% Chebyshev (MVUE) UCL	1338
95% Chebyshev (MVUE) UCL	1630	97.5% Chebyshev (MVUE) UCL	2034
99% Chebyshev (MVUE) UCL	2829		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	778.1	95% Jackknife UCL	788.1
95% Standard Bootstrap UCL	773.2	95% Bootstrap-t UCL	823.4
95% Hall's Bootstrap UCL	820.7	95% Percentile Bootstrap UCL	789.5
95% BCA Bootstrap UCL	789.7		
90% Chebyshev(Mean, Sd) UCL	930.5	95% Chebyshev(Mean, Sd) UCL	1083
97.5% Chebyshev(Mean, Sd) UCL	1295	99% Chebyshev(Mean, Sd) UCL	1712

Suggested UCL to Use

95% Student's-t UCL	788.1

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (manganese_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	15	Mean	530.8
Maximum	1500	Median	550
SD	444.7	Std. Error of Mean	118.9
Coefficient of Variation	0.838	Skewness	0.686

Normal GOF Test

Shapiro Wilk Test Statistic	0.929	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.149	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	741.3	95% Adjusted-CLT UCL (Chen-1995)	749.6

		95% Modified-t UCL (Johnson-1978)	744.9

Gamma GOF Test

A-D Test Statistic	0.453	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.187	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.236	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.926	k star (bias corrected MLE)	0.775
Theta hat (MLE)	573	Theta star (bias corrected MLE)	684.5
nu hat (MLE)	25.94	nu star (bias corrected)	21.71
MLE Mean (bias corrected)	530.8	MLE Sd (bias corrected)	602.8
		Approximate Chi Square Value (0.05)	12.12
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	11.18

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	950.7	95% Adjusted Gamma UCL (use when n<50)	1031

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.867	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.222	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.708	Mean of logged Data	5.645
Maximum of Logged Data	7.313	SD of logged Data	1.473

Assuming Lognormal Distribution

95% H-UCL	3703	90% Chebyshev (MVUE) UCL	1702
95% Chebyshev (MVUE) UCL	2142	97.5% Chebyshev (MVUE) UCL	2753
99% Chebyshev (MVUE) UCL	3953		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	726.3	95% Jackknife UCL	741.3
95% Standard Bootstrap UCL	721.1	95% Bootstrap-t UCL	787.3
95% Hall's Bootstrap UCL	772.1	95% Percentile Bootstrap UCL	728.6
95% BCA Bootstrap UCL	733.6		
90% Chebyshev(Mean, Sd) UCL	887.3	95% Chebyshev(Mean, Sd) UCL	1049
97.5% Chebyshev(Mean, Sd) UCL	1273	99% Chebyshev(Mean, Sd) UCL	1713

Suggested UCL to Use

95% Student's-t UCL	741.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (nickel)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	8
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.53	Minimum Non-Detect	0.5
Maximum Detect	4.6	Maximum Non-Detect	0.5
Variance Detects	2.408	Percent Non-Detects	57.14%
Mean Detects	1.562	SD Detects	1.552
Median Detects	0.955	CV Detects	0.994
Skewness Detects	2.046	Kurtosis Detects	4.333
Mean of Logged Detects	0.133	SD of Logged Detects	0.809

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.728	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.298	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.955	KM Standard Error of Mean	0.312
KM SD	1.066	95% KM (BCA) UCL	1.498
95% KM (t) UCL	1.508	95% KM (Percentile Bootstrap) UCL	1.492
95% KM (z) UCL	1.468	95% KM Bootstrap t UCL	2.99
90% KM Chebyshev UCL	1.891	95% KM Chebyshev UCL	2.315
97.5% KM Chebyshev UCL	2.904	99% KM Chebyshev UCL	4.06

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.501	Anderson-Darling GOF Test
5% A-D Critical Value	0.706	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.244	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.337	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.748	k star (bias corrected MLE)	0.985
Theta hat (MLE)	0.893	Theta star (bias corrected MLE)	1.585
nu hat (MLE)	20.98	nu star (bias corrected)	11.82
Mean (detects)	1.562		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.675
Maximum	4.6	Median	0.01
SD	1.249	CV	1.851
k hat (MLE)	0.314	k star (bias corrected MLE)	0.294
Theta hat (MLE)	2.151	Theta star (bias corrected MLE)	2.295

nu hat (MLE)	8.786	nu star (bias corrected)	8.237
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (8.24, α)	2.873	Adjusted Chi Square Value (8.24, β)	2.469
95% Gamma Approximate UCL (use when n>=50)	1.935	95% Gamma Adjusted UCL (use when n<50)	2.252

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.955	SD (KM)	1.066
Variance (KM)	1.136	SE of Mean (KM)	0.312
k hat (KM)	0.803	k star (KM)	0.678
nu hat (KM)	22.48	nu star (KM)	19
theta hat (KM)	1.189	theta star (KM)	1.408
80% gamma percentile (KM)	1.571	90% gamma percentile (KM)	2.415
95% gamma percentile (KM)	3.287	99% gamma percentile (KM)	5.376

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (19.00, α)	10.11	Adjusted Chi Square Value (19.00, β)	9.265
95% Gamma Approximate KM-UCL (use when n>=50)	1.794	95% Gamma Adjusted KM-UCL (use when n<50)	1.958

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.898	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.222	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.731	Mean in Log Scale	-1.396
SD in Original Scale	1.219	SD in Log Scale	1.617
95% t UCL (assumes normality of ROS data)	1.308	95% Percentile Bootstrap UCL	1.279
95% BCA Bootstrap UCL	1.551	95% Bootstrap t UCL	2.196
95% H-UCL (Log ROS)	5.296		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.339	KM Geo Mean	0.713
KM SD (logged)	0.633	95% Critical H Value (KM-Log)	2.257
KM Standard Error of Mean (logged)	0.185	95% H-UCL (KM -Log)	1.294
KM SD (logged)	0.633	95% Critical H Value (KM-Log)	2.257
KM Standard Error of Mean (logged)	0.185		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.812	Mean in Log Scale	-0.735
SD in Original Scale	1.175	SD in Log Scale	0.928
95% t UCL (Assumes normality)	1.368	95% H-Stat UCL	1.467

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.508

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (nickel_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	9	Number of Non-Detects	5
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	0.52	Minimum Non-Detect	0.5
Maximum Detect	8.7	Maximum Non-Detect	0.5
Variance Detects	7.087	Percent Non-Detects	35.71%
Mean Detects	1.683	SD Detects	2.662
Median Detects	0.65	CV Detects	1.581
Skewness Detects	2.875	Kurtosis Detects	8.402
Mean of Logged Detects	-0.0334	SD of Logged Detects	0.916

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.502	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.391	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.261	KM Standard Error of Mean	0.593
KM SD	2.091	95% KM (BCA) UCL	2.411
95% KM (t) UCL	2.31	95% KM (Percentile Bootstrap) UCL	2.374
95% KM (z) UCL	2.236	95% KM Bootstrap t UCL	11.32
90% KM Chebyshev UCL	3.039	95% KM Chebyshev UCL	3.844
97.5% KM Chebyshev UCL	4.962	99% KM Chebyshev UCL	7.158

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.49	Anderson-Darling GOF Test
5% A-D Critical Value	0.743	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.363	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.287	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.037	k star (bias corrected MLE)	0.766
Theta hat (MLE)	1.623	Theta star (bias corrected MLE)	2.199
nu hat (MLE)	18.67	nu star (bias corrected)	13.78
Mean (detects)	1.683		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.086
Maximum	8.7	Median	0.525
SD	2.248	CV	2.071
k hat (MLE)	0.38	k star (bias corrected MLE)	0.346
Theta hat (MLE)	2.86	Theta star (bias corrected MLE)	3.139
nu hat (MLE)	10.63	nu star (bias corrected)	9.684
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (9.68, α)	3.745	Adjusted Chi Square Value (9.68, β)	3.27
95% Gamma Approximate UCL (use when n>=50)	2.807	95% Gamma Adjusted UCL (use when n<50)	3.215

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.261	SD (KM)	2.091
Variance (KM)	4.371	SE of Mean (KM)	0.593
k hat (KM)	0.364	k star (KM)	0.333
nu hat (KM)	10.18	nu star (KM)	9.333
theta hat (KM)	3.467	theta star (KM)	3.782
80% gamma percentile (KM)	1.979	90% gamma percentile (KM)	3.667
95% gamma percentile (KM)	5.572	99% gamma percentile (KM)	10.46

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (9.33, α)	3.529	Adjusted Chi Square Value (9.33, β)	3.071
95% Gamma Approximate KM-UCL (use when n>=50)	3.334	95% Gamma Adjusted KM-UCL (use when n<50)	3.831

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.725	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.3	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.125	Mean in Log Scale	-0.82
SD in Original Scale	2.228	SD in Log Scale	1.349
95% t UCL (assumes normality of ROS data)	2.18	95% Percentile Bootstrap UCL	2.261
95% BCA Bootstrap UCL	2.94	95% Bootstrap t UCL	6.378
95% H-UCL (Log ROS)	3.918		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.269	KM Geo Mean	0.764
KM SD (logged)	0.761	95% Critical H Value (KM-Log)	2.422
KM Standard Error of Mean (logged)	0.216	95% H-UCL (KM -Log)	1.702
KM SD (logged)	0.761	95% Critical H Value (KM-Log)	2.422
KM Standard Error of Mean (logged)	0.216		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.171	Mean in Log Scale	-0.517
SD in Original Scale	2.207	SD in Log Scale	0.984
95% t UCL (Assumes normality)	2.216	95% H-Stat UCL	2.06

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	3.844

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (potassium)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	280	Mean	2144
Maximum	8400	Median	1500
SD	2310	Std. Error of Mean	617.4
Coefficient of Variation	1.077	Skewness	1.984

Normal GOF Test

Shapiro Wilk Test Statistic	0.725	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.362	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3238	95% Adjusted-CLT UCL (Chen-1995)	3510
		95% Modified-t UCL (Johnson-1978)	3292

Gamma GOF Test

A-D Test Statistic	0.661	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.268	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.234	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.311	k star (bias corrected MLE)	1.078
Theta hat (MLE)	1635	Theta star (bias corrected MLE)	1989
nu hat (MLE)	36.71	nu star (bias corrected)	30.18
MLE Mean (bias corrected)	2144	MLE Sd (bias corrected)	2065
		Approximate Chi Square Value (0.05)	18.63
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	17.44

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	3473	95% Adjusted Gamma UCL (use when n<50)	3711

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.203	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.635	Mean of logged Data	7.243
Maximum of Logged Data	9.036	SD of logged Data	0.939

Assuming Lognormal Distribution

95% H-UCL	4380	90% Chebyshev (MVUE) UCL	3775
95% Chebyshev (MVUE) UCL	4541	97.5% Chebyshev (MVUE) UCL	5605
99% Chebyshev (MVUE) UCL	7694		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3160	95% Jackknife UCL	3238
95% Standard Bootstrap UCL	3122	95% Bootstrap-t UCL	4512
95% Hall's Bootstrap UCL	6645	95% Percentile Bootstrap UCL	3211
95% BCA Bootstrap UCL	3414		
90% Chebyshev(Mean, Sd) UCL	3997	95% Chebyshev(Mean, Sd) UCL	4836
97.5% Chebyshev(Mean, Sd) UCL	6000	99% Chebyshev(Mean, Sd) UCL	8287

Suggested UCL to Use

95% Adjusted Gamma UCL 3711

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (potassium_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	270	Mean	2056
Maximum	8300	Median	1350
SD	2249	Std. Error of Mean	601.1
Coefficient of Variation	1.094	Skewness	2.053

Normal GOF Test

Shapiro Wilk Test Statistic	0.721	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.349	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3121	95% Adjusted-CLT UCL (Chen-1995)	3398

95% Modified-t UCL (Johnson-1978)	3176

Gamma GOF Test

A-D Test Statistic	0.656	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.25	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.234	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.295	k star (bias corrected MLE)	1.065
Theta hat (MLE)	1588	Theta star (bias corrected MLE)	1930
nu hat (MLE)	36.27	nu star (bias corrected)	29.83
MLE Mean (bias corrected)	2056	MLE Sd (bias corrected)	1992
		Approximate Chi Square Value (0.05)	18.36
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	17.17

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	3341	95% Adjusted Gamma UCL (use when n<50)	3572

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.956	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.598	Mean of logged Data	7.195
Maximum of Logged Data	9.024	SD of logged Data	0.942

Assuming Lognormal Distribution

95% H-UCL	4200	90% Chebyshev (MVUE) UCL	3613
95% Chebyshev (MVUE) UCL	4348	97.5% Chebyshev (MVUE) UCL	5367
99% Chebyshev (MVUE) UCL	7370		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3045	95% Jackknife UCL	3121
95% Standard Bootstrap UCL	3016	95% Bootstrap-t UCL	4262
95% Hall's Bootstrap UCL	4303	95% Percentile Bootstrap UCL	3105
95% BCA Bootstrap UCL	3426		
90% Chebyshev(Mean, Sd) UCL	3860	95% Chebyshev(Mean, Sd) UCL	4676
97.5% Chebyshev(Mean, Sd) UCL	5810	99% Chebyshev(Mean, Sd) UCL	8037

Suggested UCL to Use

95% Adjusted Gamma UCL	3572

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (sodium)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	2400	Mean	15586
Maximum	61700	Median	5050
SD	22010	Std. Error of Mean	5882
Coefficient of Variation	1.412	Skewness	1.599

Normal GOF Test

Shapiro Wilk Test Statistic	0.592	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.436	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	26003	95% Adjusted-CLT UCL (Chen-1995)	27948
		95% Modified-t UCL (Johnson-1978)	26422

Gamma GOF Test

A-D Test Statistic	2.214	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.381	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.237	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.819	k star (bias corrected MLE)	0.691
Theta hat (MLE)	19030	Theta star (bias corrected MLE)	22551
nu hat (MLE)	22.93	nu star (bias corrected)	19.35
MLE Mean (bias corrected)	15586	MLE Sd (bias corrected)	18748
		Approximate Chi Square Value (0.05)	10.37
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	9.512

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	29072	95% Adjusted Gamma UCL (use when n<50)	31707

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.748	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.308	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.783	Mean of logged Data	8.932

Maximum of Logged Data	11.03	SD of logged Data	1.118

Assuming Lognormal Distribution

95% H-UCL	35707	90% Chebyshev (MVUE) UCL	26269
95% Chebyshev (MVUE) UCL	32171	97.5% Chebyshev (MVUE) UCL	40362
99% Chebyshev (MVUE) UCL	56453		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	25261	95% Jackknife UCL	26003
95% Standard Bootstrap UCL	24487	95% Bootstrap-t UCL	29626
95% Hall's Bootstrap UCL	21916	95% Percentile Bootstrap UCL	25600
95% BCA Bootstrap UCL	27186		
90% Chebyshev(Mean, Sd) UCL	33233	95% Chebyshev(Mean, Sd) UCL	41226
97.5% Chebyshev(Mean, Sd) UCL	52321	99% Chebyshev(Mean, Sd) UCL	74115

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 41226

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (sodium_d)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	2300	Mean	15900
Maximum	64300	Median	3950
SD	22864	Std. Error of Mean	6111
Coefficient of Variation	1.438	Skewness	1.586

Normal GOF Test

Shapiro Wilk Test Statistic	0.607	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.375	Lilliefors GOF Test
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	26721	95% Adjusted-CLT UCL (Chen-1995)	28718
		95% Modified-t UCL (Johnson-1978)	27153

Gamma GOF Test

A-D Test Statistic	2.062	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.77	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.326	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.237	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.76	k star (bias corrected MLE)	0.645
Theta hat (MLE)	20926	Theta star (bias corrected MLE)	24665
nu hat (MLE)	21.28	nu star (bias corrected)	18.05
MLE Mean (bias corrected)	15900	MLE Sd (bias corrected)	19804
		Approximate Chi Square Value (0.05)	9.427
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	8.61

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	30444	95% Adjusted Gamma UCL (use when n<50)	33331

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.756	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.256	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.741	Mean of logged Data	8.888
Maximum of Logged Data	11.07	SD of logged Data	1.182

Assuming Lognormal Distribution

95% H-UCL	40260	90% Chebyshev (MVUE) UCL	27633
95% Chebyshev (MVUE) UCL	34034	97.5% Chebyshev (MVUE) UCL	42918
99% Chebyshev (MVUE) UCL	60370		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	25951	95% Jackknife UCL	26721
95% Standard Bootstrap UCL	25627	95% Bootstrap-t UCL	30614
95% Hall's Bootstrap UCL	22736	95% Percentile Bootstrap UCL	27129
95% BCA Bootstrap UCL	28243		
90% Chebyshev(Mean, Sd) UCL	34232	95% Chebyshev(Mean, Sd) UCL	42535
97.5% Chebyshev(Mean, Sd) UCL	54061	99% Chebyshev(Mean, Sd) UCL	76700

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 42535

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (sulfate)

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	18	Number of Non-Detects	2
Number of Distinct Detects	18	Number of Distinct Non-Detects	2

Minimum Detect	780	Minimum Non-Detect	110
Maximum Detect	7160	Maximum Non-Detect	600
Variance Detects	4801168	Percent Non-Detects	10%
Mean Detects	3385	SD Detects	2191
Median Detects	2890	CV Detects	0.647
Skewness Detects	0.437	Kurtosis Detects	-1.277
Mean of Logged Detects	7.894	SD of Logged Detects	0.734

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.889	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.215	Lilliefors GOF Test
5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3058	KM Standard Error of Mean	516.9
KM SD	2246	95% KM (BCA) UCL	3982
95% KM (t) UCL	3951	95% KM (Percentile Bootstrap) UCL	3914
95% KM (z) UCL	3908	95% KM Bootstrap t UCL	3965
90% KM Chebyshev UCL	4608	95% KM Chebyshev UCL	5310
97.5% KM Chebyshev UCL	6285	99% KM Chebyshev UCL	8200

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.664	Anderson-Darling GOF Test
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.191	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.206	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.3	k star (bias corrected MLE)	1.954
Theta hat (MLE)	1472	Theta star (bias corrected MLE)	1733
nu hat (MLE)	82.79	nu star (bias corrected)	70.33
Mean (detects)	3385		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	58.59	Mean	3052
Maximum	7160	Median	1985
SD	2312	CV	0.757
k hat (MLE)	1.114	k star (bias corrected MLE)	0.98
Theta hat (MLE)	2740	Theta star (bias corrected MLE)	3114
nu hat (MLE)	44.56	nu star (bias corrected)	39.21
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (39.21, α)	25.87	Adjusted Chi Square Value (39.21, β)	25.01
95% Gamma Approximate UCL (use when n>=50)	4627	95% Gamma Adjusted UCL (use when n<50)	4785

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3058	SD (KM)	2246

Variance (KM)	5046299	SE of Mean (KM)	516.9
k hat (KM)	1.853	k star (KM)	1.608
nu hat (KM)	74.1	nu star (KM)	64.32
theta hat (KM)	1650	theta star (KM)	1901
80% gamma percentile (KM)	4694	90% gamma percentile (KM)	6265
95% gamma percentile (KM)	7783	99% gamma percentile (KM)	11195

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (64.32, α)	46.87	Adjusted Chi Square Value (64.32, β)	45.69
95% Gamma Approximate KM-UCL (use when n>=50)	4196	95% Gamma Adjusted KM-UCL (use when n<50)	4304

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.917	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	Lilliefors GOF Test
5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3096	Mean in Log Scale	7.726
SD in Original Scale	2255	SD in Log Scale	0.866
95% t UCL (assumes normality of ROS data)	3968	95% Percentile Bootstrap UCL	3935
95% BCA Bootstrap UCL	3996	95% Bootstrap t UCL	4035
95% H-UCL (Log ROS)	5363		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	7.575	KM Geo Mean	1949
KM SD (logged)	1.173	95% Critical H Value (KM-Log)	2.894
KM Standard Error of Mean (logged)	0.27	95% H-UCL (KM -Log)	8447
KM SD (logged)	1.173	95% Critical H Value (KM-Log)	2.894
KM Standard Error of Mean (logged)	0.27		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3064	Mean in Log Scale	7.59
SD in Original Scale	2296	SD in Log Scale	1.197
95% t UCL (Assumes normality)	3952	95% H-Stat UCL	9058

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	4304	95% GROS Adjusted Gamma UCL	4785

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/7/2016 12:48:51 PM
From File	2016 Onsite SED Dataset.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Result (acetone)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	8
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	0.0241	Minimum Non-Detect	0.0097
Maximum Detect	0.278	Maximum Non-Detect	0.025
Variance Detects	0.0116	Percent Non-Detects	61.54%
Mean Detects	0.0914	SD Detects	0.108
Median Detects	0.0328	CV Detects	1.178
Skewness Detects	1.922	Kurtosis Detects	3.667
Mean of Logged Detects	-2.858	SD of Logged Detects	1.018

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.723	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.307	Lilliefors GOF Test
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0415	KM Standard Error of Mean	0.0222
KM SD	0.0717	95% KM (BCA) UCL	0.0849
95% KM (t) UCL	0.0811	95% KM (Percentile Bootstrap) UCL	0.0802
95% KM (z) UCL	0.078	95% KM Bootstrap t UCL	0.206
90% KM Chebyshev UCL	0.108	95% KM Chebyshev UCL	0.138
97.5% KM Chebyshev UCL	0.18	99% KM Chebyshev UCL	0.263

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.569	Anderson-Darling GOF Test
5% A-D Critical Value	0.689	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.339	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.363	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.213	k star (bias corrected MLE)	0.619
Theta hat (MLE)	0.0754	Theta star (bias corrected MLE)	0.148
nu hat (MLE)	12.13	nu star (bias corrected)	6.187
Mean (detects)	0.0914		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0413
Maximum	0.278	Median	0.01
SD	0.0746	CV	1.806
k hat (MLE)	0.795	k star (bias corrected MLE)	0.663
Theta hat (MLE)	0.052	Theta star (bias corrected MLE)	0.0623
nu hat (MLE)	20.68	nu star (bias corrected)	17.24
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (17.24, α)	8.845	Adjusted Chi Square Value (17.24, β)	8.001
95% Gamma Approximate UCL (use when n>=50)	0.0806	95% Gamma Adjusted UCL (use when n<50)	0.089

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0415	SD (KM)	0.0717
Variance (KM)	0.00514	SE of Mean (KM)	0.0222
k hat (KM)	0.335	k star (KM)	0.309
nu hat (KM)	8.699	nu star (KM)	8.025
theta hat (KM)	0.124	theta star (KM)	0.134
80% gamma percentile (KM)	0.064	90% gamma percentile (KM)	0.122
95% gamma percentile (KM)	0.188	99% gamma percentile (KM)	0.359

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (8.02, α)	2.749	Adjusted Chi Square Value (8.02, β)	2.329
95% Gamma Approximate KM-UCL (use when n>=50)	0.121	95% Gamma Adjusted KM-UCL (use when n<50)	0.143

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.857	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.309	Lilliefors GOF Test
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0371	Mean in Log Scale	-4.771
SD in Original Scale	0.0766	SD in Log Scale	1.753
95% t UCL (assumes normality of ROS data)	0.0749	95% Percentile Bootstrap UCL	0.0744
95% BCA Bootstrap UCL	0.101	95% Bootstrap t UCL	0.214
95% H-UCL (Log ROS)	0.335		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.932	KM Geo Mean	0.0196
KM SD (logged)	1.028	95% Critical H Value (KM-Log)	2.897
KM Standard Error of Mean (logged)	0.322	95% H-UCL (KM -Log)	0.0786
KM SD (logged)	1.028	95% Critical H Value (KM-Log)	2.897
KM Standard Error of Mean (logged)	0.322		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0404	Mean in Log Scale	-4.061
SD in Original Scale	0.0751	SD in Log Scale	1.176
95% t UCL (Assumes normality)	0.0775	95% H-Stat UCL	0.101

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.0811

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (aluminum)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	3710	Mean	10855
Maximum	30000	Median	6510
SD	7968	Std. Error of Mean	2210
Coefficient of Variation	0.734	Skewness	1.321

Normal GOF Test

Shapiro Wilk Test Statistic	0.804	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.321	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	14793	95% Adjusted-CLT UCL (Chen-1995)	15355
		95% Modified-t UCL (Johnson-1978)	14928

Gamma GOF Test

A-D Test Statistic	0.926	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.309	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.239	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.434	k star (bias corrected MLE)	1.924
Theta hat (MLE)	4459	Theta star (bias corrected MLE)	5642
nu hat (MLE)	63.29	nu star (bias corrected)	50.02
MLE Mean (bias corrected)	10855	MLE Sd (bias corrected)	7826
		Approximate Chi Square Value (0.05)	34.78
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	32.98

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	15610	95% Adjusted Gamma UCL (use when n<50)	16464

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.881	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.282	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.219	Mean of logged Data	9.073
Maximum of Logged Data	10.31	SD of logged Data	0.669

Assuming Lognormal Distribution

95% H-UCL	17092	90% Chebyshev (MVUE) UCL	16891
95% Chebyshev (MVUE) UCL	19702	97.5% Chebyshev (MVUE) UCL	23603
99% Chebyshev (MVUE) UCL	31265		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	14490	95% Jackknife UCL	14793
95% Standard Bootstrap UCL	14425	95% Bootstrap-t UCL	16433
95% Hall's Bootstrap UCL	15290	95% Percentile Bootstrap UCL	14635
95% BCA Bootstrap UCL	15205		
90% Chebyshev(Mean, Sd) UCL	17485	95% Chebyshev(Mean, Sd) UCL	20488
97.5% Chebyshev(Mean, Sd) UCL	24656	99% Chebyshev(Mean, Sd) UCL	32844

Suggested UCL to Use

95% H-UCL	17092

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Result (arsenic)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1.9	Mean	33.38
Maximum	71.6	Median	36.8
SD	27.83	Std. Error of Mean	7.719
Coefficient of Variation	0.834	Skewness	0.0842

Normal GOF Test

Shapiro Wilk Test Statistic	0.849	Shapiro Wilk GOF Test

5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.213	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	47.13	95% Adjusted-CLT UCL (Chen-1995)	46.27
		95% Modified-t UCL (Johnson-1978)	47.16

Gamma GOF Test

A-D Test Statistic	0.835	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.244	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.951	k star (bias corrected MLE)	0.783
Theta hat (MLE)	35.1	Theta star (bias corrected MLE)	42.64
nu hat (MLE)	24.72	nu star (bias corrected)	20.35
MLE Mean (bias corrected)	33.38	MLE Sd (bias corrected)	37.73
		Approximate Chi Square Value (0.05)	11.11
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	10.15

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	61.14	95% Adjusted Gamma UCL (use when n<50)	66.93

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.853	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.866	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.238	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.642	Mean of logged Data	2.897
Maximum of Logged Data	4.271	SD of logged Data	1.351

Assuming Lognormal Distribution

95% H-UCL	176.3	90% Chebyshev (MVUE) UCL	90.28
95% Chebyshev (MVUE) UCL	112.9	97.5% Chebyshev (MVUE) UCL	144.4
99% Chebyshev (MVUE) UCL	206.2		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	46.07	95% Jackknife UCL	47.13
95% Standard Bootstrap UCL	45.41	95% Bootstrap-t UCL	46.77
95% Hall's Bootstrap UCL	44.64	95% Percentile Bootstrap UCL	46.32
95% BCA Bootstrap UCL	46.02		
90% Chebyshev(Mean, Sd) UCL	56.53	95% Chebyshev(Mean, Sd) UCL	67.02
97.5% Chebyshev(Mean, Sd) UCL	81.58	99% Chebyshev(Mean, Sd) UCL	110.2

Suggested UCL to Use

95% Student's-t UCL	47.13

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (barium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	12	Number of Non-Detects	1
Number of Distinct Detects	12	Number of Distinct Non-Detects	1
Minimum Detect	28.2	Minimum Non-Detect	52
Maximum Detect	250	Maximum Non-Detect	52
Variance Detects	3616	Percent Non-Detects	7.692%
Mean Detects	70.98	SD Detects	60.14
Median Detects	50.9	CV Detects	0.847
Skewness Detects	2.767	Kurtosis Detects	8.449
Mean of Logged Detects	4.063	SD of Logged Detects	0.594

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.646	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.274	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	68.5	KM Standard Error of Mean	16.24
KM SD	56.02	95% KM (BCA) UCL	98.15
95% KM (t) UCL	97.44	95% KM (Percentile Bootstrap) UCL	98.58
95% KM (z) UCL	95.21	95% KM Bootstrap t UCL	139.2
90% KM Chebyshev UCL	117.2	95% KM Chebyshev UCL	139.3
97.5% KM Chebyshev UCL	169.9	99% KM Chebyshev UCL	230.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.748	Anderson-Darling GOF Test
5% A-D Critical Value	0.74	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.191	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.248	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.666	k star (bias corrected MLE)	2.055
Theta hat (MLE)	26.62	Theta star (bias corrected MLE)	34.54
nu hat (MLE)	63.99	nu star (bias corrected)	49.32
Mean (detects)	70.98		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	28.2	Mean	67.85
Maximum	250	Median	49.8
SD	58.67	CV	0.865
k hat (MLE)	2.603	k star (bias corrected MLE)	2.054
Theta hat (MLE)	26.07	Theta star (bias corrected MLE)	33.04
nu hat (MLE)	67.68	nu star (bias corrected)	53.4
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (53.40, α)	37.61	Adjusted Chi Square Value (53.40, β)	35.73
95% Gamma Approximate UCL (use when n>=50)	96.34	95% Gamma Adjusted UCL (use when n<50)	101.4

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	68.5	SD (KM)	56.02
Variance (KM)	3138	SE of Mean (KM)	16.24
k hat (KM)	1.495	k star (KM)	1.202
nu hat (KM)	38.88	nu star (KM)	31.24
theta hat (KM)	45.81	theta star (KM)	57.01
80% gamma percentile (KM)	108.5	90% gamma percentile (KM)	150.7
95% gamma percentile (KM)	192.4	99% gamma percentile (KM)	288

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (31.24, α)	19.47	Adjusted Chi Square Value (31.24, β)	18.15
95% Gamma Approximate KM-UCL (use when n>=50)	109.9	95% Gamma Adjusted KM-UCL (use when n<50)	117.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.901	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.158	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	68.47	Mean in Log Scale	4.031
SD in Original Scale	58.28	SD in Log Scale	0.58
95% t UCL (assumes normality of ROS data)	97.28	95% Percentile Bootstrap UCL	97.24
95% BCA Bootstrap UCL	111.2	95% Bootstrap t UCL	143.2
95% H-UCL (Log ROS)	96.48		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	4.031	KM Geo Mean	56.3
KM SD (logged)	0.56	95% Critical H Value (KM-Log)	2.184
KM Standard Error of Mean (logged)	0.163	95% H-UCL (KM -Log)	93.75
KM SD (logged)	0.56	95% Critical H Value (KM-Log)	2.184
KM Standard Error of Mean (logged)	0.163		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	67.52	Mean in Log Scale	4.001
SD in Original Scale	58.91	SD in Log Scale	0.611

95% t UCL (Assumes normality)	96.64	95% H-Stat UCL	97.93

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	117.9	95% GROS Adjusted Gamma UCL	101.4

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (benzo(a)anthracene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	7	Number of Non-Detects	6
Number of Distinct Detects	7	Number of Distinct Non-Detects	6
Minimum Detect	0.00453	Minimum Non-Detect	0.081
Maximum Detect	0.206	Maximum Non-Detect	0.59
Variance Detects	0.00521	Percent Non-Detects	46.15%
Mean Detects	0.0453	SD Detects	0.0722
Median Detects	0.0146	CV Detects	1.594
Skewness Detects	2.45	Kurtosis Detects	6.18
Mean of Logged Detects	-3.904	SD of Logged Detects	1.294

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.618	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.385	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0341	KM Standard Error of Mean	0.0171
KM SD	0.0535	95% KM (BCA) UCL	0.0653
95% KM (t) UCL	0.0646	95% KM (Percentile Bootstrap) UCL	0.0631
95% KM (z) UCL	0.0623	95% KM Bootstrap t UCL	0.117
90% KM Chebyshev UCL	0.0854	95% KM Chebyshev UCL	0.109
97.5% KM Chebyshev UCL	0.141	99% KM Chebyshev UCL	0.204

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.558	Anderson-Darling GOF Test
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.241	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.323	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.741	k star (bias corrected MLE)	0.519
Theta hat (MLE)	0.0611	Theta star (bias corrected MLE)	0.0873
nu hat (MLE)	10.37	nu star (bias corrected)	7.26
Mean (detects)	0.0453		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00453	Mean	0.031
Maximum	0.206	Median	0.0134
SD	0.0536	CV	1.73
k hat (MLE)	0.977	k star (bias corrected MLE)	0.803
Theta hat (MLE)	0.0317	Theta star (bias corrected MLE)	0.0386
nu hat (MLE)	25.39	nu star (bias corrected)	20.87
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (20.87, α)	11.49	Adjusted Chi Square Value (20.87, β)	10.51
95% Gamma Approximate UCL (use when n>=50)	0.0562	95% Gamma Adjusted UCL (use when n<50)	0.0615

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0341	SD (KM)	0.0535
Variance (KM)	0.00286	SE of Mean (KM)	0.0171
k hat (KM)	0.407	k star (KM)	0.365
nu hat (KM)	10.59	nu star (KM)	9.477
theta hat (KM)	0.0838	theta star (KM)	0.0936
80% gamma percentile (KM)	0.0544	90% gamma percentile (KM)	0.0979
95% gamma percentile (KM)	0.146	99% gamma percentile (KM)	0.269

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (9.48, α)	3.618	Adjusted Chi Square Value (9.48, β)	3.12
95% Gamma Approximate KM-UCL (use when n>=50)	0.0894	95% Gamma Adjusted KM-UCL (use when n<50)	0.104

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.938	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.17	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0313	Mean in Log Scale	-4.043
SD in Original Scale	0.0534	SD in Log Scale	0.929
95% t UCL (assumes normality of ROS data)	0.0577	95% Percentile Bootstrap UCL	0.0593
95% BCA Bootstrap UCL	0.0754	95% Bootstrap t UCL	0.161
95% H-UCL (Log ROS)	0.0562		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.066	KM Geo Mean	0.0172
KM SD (logged)	1.065	95% Critical H Value (KM-Log)	2.962
KM Standard Error of Mean (logged)	0.396	95% H-UCL (KM -Log)	0.0752
KM SD (logged)	1.065	95% Critical H Value (KM-Log)	2.962
KM Standard Error of Mean (logged)	0.396		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0691	Mean in Log Scale	-3.313
SD in Original Scale	0.0858	SD in Log Scale	1.229
95% t UCL (Assumes normality)	0.112	95% H-Stat UCL	0.246

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	0.117	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1	0.104

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (benzo(a)pyrene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	6	Number of Non-Detects	7
Number of Distinct Detects	6	Number of Distinct Non-Detects	7
Minimum Detect	0.00426	Minimum Non-Detect	0.0046
Maximum Detect	0.228	Maximum Non-Detect	0.59
Variance Detects	0.00793	Percent Non-Detects	53.85%
Mean Detects	0.0465	SD Detects	0.0891
Median Detects	0.0102	CV Detects	1.917
Skewness Detects	2.435	Kurtosis Detects	5.944
Mean of Logged Detects	-4.162	SD of Logged Detects	1.398

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.545	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.459	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0274	KM Standard Error of Mean	0.0192
KM SD	0.0607	95% KM (BCA) UCL	0.0634
95% KM (t) UCL	0.0617	95% KM (Percentile Bootstrap) UCL	0.0625
95% KM (z) UCL	0.059	95% KM Bootstrap t UCL	0.352
90% KM Chebyshev UCL	0.0851	95% KM Chebyshev UCL	0.111
97.5% KM Chebyshev UCL	0.147	99% KM Chebyshev UCL	0.219

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.01	Anderson-Darling GOF Test
5% A-D Critical Value	0.732	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.394	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.347	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.57	k star (bias corrected MLE)	0.396
Theta hat (MLE)	0.0815	Theta star (bias corrected MLE)	0.117
nu hat (MLE)	6.839	nu star (bias corrected)	4.753
Mean (detects)	0.0465		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00426	Mean	0.0268
Maximum	0.228	Median	0.01
SD	0.0605	CV	2.256
k hat (MLE)	0.764	k star (bias corrected MLE)	0.639
Theta hat (MLE)	0.0351	Theta star (bias corrected MLE)	0.042
nu hat (MLE)	19.85	nu star (bias corrected)	16.6
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (16.60, α)	8.391	Adjusted Chi Square Value (16.60, β)	7.572
95% Gamma Approximate UCL (use when n>=50)	0.0531	95% Gamma Adjusted UCL (use when n<50)	0.0588

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0274	SD (KM)	0.0607
Variance (KM)	0.00368	SE of Mean (KM)	0.0192
k hat (KM)	0.204	k star (KM)	0.208
nu hat (KM)	5.306	nu star (KM)	5.415
theta hat (KM)	0.134	theta star (KM)	0.132
80% gamma percentile (KM)	0.0369	90% gamma percentile (KM)	0.0829
95% gamma percentile (KM)	0.14	99% gamma percentile (KM)	0.295

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (5.41, α)	1.348	Adjusted Chi Square Value (5.41, β)	1.083
95% Gamma Approximate KM-UCL (use when n>=50)	0.11	95% Gamma Adjusted KM-UCL (use when n<50)	0.137

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.81	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.292	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0257	Mean in Log Scale	-4.564
SD in Original Scale	0.0609	SD in Log Scale	1.042
95% t UCL (assumes normality of ROS data)	0.0558	95% Percentile Bootstrap UCL	0.0594
95% BCA Bootstrap UCL	0.0767	95% Bootstrap t UCL	0.484
95% H-UCL (Log ROS)	0.0431		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.546	KM Geo Mean	0.0106
KM SD (logged)	1.049	95% Critical H Value (KM-Log)	2.934
KM Standard Error of Mean (logged)	0.361	95% H-UCL (KM -Log)	0.0447

KM SD (logged)	1.049	95% Critical H Value (KM-Log)	2.934
KM Standard Error of Mean (logged)	0.361		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0663	Mean in Log Scale	-3.599
SD in Original Scale	0.0914	SD in Log Scale	1.48
95% t UCL (Assumes normality)	0.111	95% H-Stat UCL	0.405

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.111

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (benzo(b)fluoranthene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	7	Number of Non-Detects	6
Number of Distinct Detects	6	Number of Distinct Non-Detects	6
Minimum Detect	0.0108	Minimum Non-Detect	0.081
Maximum Detect	0.157	Maximum Non-Detect	0.59
Variance Detects	0.00264	Percent Non-Detects	46.15%
Mean Detects	0.0423	SD Detects	0.0513
Median Detects	0.0271	CV Detects	1.213
Skewness Detects	2.479	Kurtosis Detects	6.333
Mean of Logged Detects	-3.562	SD of Logged Detects	0.867

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.619	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.394	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0354	KM Standard Error of Mean	0.013
KM SD	0.0394	95% KM (BCA) UCL	0.0607
95% KM (t) UCL	0.0586	95% KM (Percentile Bootstrap) UCL	0.0575
95% KM (z) UCL	0.0568	95% KM Bootstrap t UCL	0.11
90% KM Chebyshev UCL	0.0745	95% KM Chebyshev UCL	0.0922
97.5% KM Chebyshev UCL	0.117	99% KM Chebyshev UCL	0.165

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.742	Anderson-Darling GOF Test
5% A-D Critical Value	0.723	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.297	Kolmogorov-Smirnov GOF

5% K-S Critical Value	0.318	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.394	k star (bias corrected MLE)	0.892
Theta hat (MLE)	0.0304	Theta star (bias corrected MLE)	0.0475
nu hat (MLE)	19.51	nu star (bias corrected)	12.48
Mean (detects)	0.0423		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0108	Mean	0.0339
Maximum	0.157	Median	0.023
SD	0.0376	CV	1.107
k hat (MLE)	2.108	k star (bias corrected MLE)	1.673
Theta hat (MLE)	0.0161	Theta star (bias corrected MLE)	0.0203
nu hat (MLE)	54.82	nu star (bias corrected)	43.5
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (43.50, α)	29.38	Adjusted Chi Square Value (43.50, β)	27.73
95% Gamma Approximate UCL (use when n>=50)	0.0502	95% Gamma Adjusted UCL (use when n<50)	0.0532

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0354	SD (KM)	0.0394
Variance (KM)	0.00155	SE of Mean (KM)	0.013
k hat (KM)	0.807	k star (KM)	0.672
nu hat (KM)	20.99	nu star (KM)	17.48
theta hat (KM)	0.0438	theta star (KM)	0.0526
80% gamma percentile (KM)	0.0582	90% gamma percentile (KM)	0.0897
95% gamma percentile (KM)	0.122	99% gamma percentile (KM)	0.2

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (17.48, α)	9.017	Adjusted Chi Square Value (17.48, β)	8.164
95% Gamma Approximate KM-UCL (use when n>=50)	0.0686	95% Gamma Adjusted KM-UCL (use when n<50)	0.0758

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.883	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.236	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0338	Mean in Log Scale	-3.643
SD in Original Scale	0.0376	SD in Log Scale	0.62
95% t UCL (assumes normality of ROS data)	0.0524	95% Percentile Bootstrap UCL	0.0545
95% BCA Bootstrap UCL	0.0649	95% Bootstrap t UCL	0.125
95% H-UCL (Log ROS)	0.0476		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.665	KM Geo Mean	0.0256

KM SD (logged)	0.703	95% Critical H Value (KM-Log)	2.376
KM Standard Error of Mean (logged)	0.253	95% H-UCL (KM -Log)	0.0531
KM SD (logged)	0.703	95% Critical H Value (KM-Log)	2.376
KM Standard Error of Mean (logged)	0.253		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0675	Mean in Log Scale	-3.128
SD in Original Scale	0.0785	SD in Log Scale	0.919
95% t UCL (Assumes normality)	0.106	95% H-Stat UCL	0.137

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	0.11	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0758

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (benzo(g,h,i)perylene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	6	Number of Non-Detects	7
Number of Distinct Detects	6	Number of Distinct Non-Detects	7
Minimum Detect	0.00561	Minimum Non-Detect	0.0037
Maximum Detect	0.119	Maximum Non-Detect	0.59
Variance Detects	0.00199	Percent Non-Detects	53.85%
Mean Detects	0.0386	SD Detects	0.0446
Median Detects	0.0166	CV Detects	1.156
Skewness Detects	1.547	Kurtosis Detects	1.659
Mean of Logged Detects	-3.807	SD of Logged Detects	1.145

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.778	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.349	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0293	KM Standard Error of Mean	0.0132
KM SD	0.0355	95% KM (BCA) UCL	0.0522
95% KM (t) UCL	0.0528	95% KM (Percentile Bootstrap) UCL	0.0492
95% KM (z) UCL	0.051	95% KM Bootstrap t UCL	0.141
90% KM Chebyshev UCL	0.0688	95% KM Chebyshev UCL	0.0867
97.5% KM Chebyshev UCL	0.112	99% KM Chebyshev UCL	0.16

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.436	Anderson-Darling GOF Test	
5% A-D Critical Value	0.714	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.311	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.341	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.041	k star (bias corrected MLE)	0.632
Theta hat (MLE)	0.037	Theta star (bias corrected MLE)	0.061
nu hat (MLE)	12.5	nu star (bias corrected)	7.582
Mean (detects)	0.0386		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00561	Mean	0.0252
Maximum	0.119	Median	0.0157
SD	0.0316	CV	1.25
k hat (MLE)	1.418	k star (bias corrected MLE)	1.142
Theta hat (MLE)	0.0178	Theta star (bias corrected MLE)	0.0221
nu hat (MLE)	36.87	nu star (bias corrected)	29.7
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (29.70, α)	18.26	Adjusted Chi Square Value (29.70, β)	16.99
95% Gamma Approximate UCL (use when n>=50)	0.0411	95% Gamma Adjusted UCL (use when n<50)	0.0441

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0293	SD (KM)	0.0355
Variance (KM)	0.00126	SE of Mean (KM)	0.0132
k hat (KM)	0.68	k star (KM)	0.575
nu hat (KM)	17.69	nu star (KM)	14.94
theta hat (KM)	0.0431	theta star (KM)	0.051
80% gamma percentile (KM)	0.0483	90% gamma percentile (KM)	0.0769
95% gamma percentile (KM)	0.107	99% gamma percentile (KM)	0.18

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (14.94, α)	7.219	Adjusted Chi Square Value (14.94, β)	6.469
95% Gamma Approximate KM-UCL (use when n>=50)	0.0606	95% Gamma Adjusted KM-UCL (use when n<50)	0.0677

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.937	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.251	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0239	Mean in Log Scale	-4.253
SD in Original Scale	0.0322	SD in Log Scale	1
95% t UCL (assumes normality of ROS data)	0.0398	95% Percentile Bootstrap UCL	0.04

95% BCA Bootstrap UCL	0.0448	95% Bootstrap t UCL	0.123
95% H-UCL (Log ROS)	0.0533		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.16	KM Geo Mean	0.0156
KM SD (logged)	1.096	95% Critical H Value (KM-Log)	3.016
KM Standard Error of Mean (logged)	0.434	95% H-UCL (KM -Log)	0.0738
KM SD (logged)	1.096	95% Critical H Value (KM-Log)	3.016
KM Standard Error of Mean (logged)	0.434		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0626	Mean in Log Scale	-3.452
SD in Original Scale	0.0778	SD in Log Scale	1.363
95% t UCL (Assumes normality)	0.101	95% H-Stat UCL	0.32

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	0.141	nma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1	0.0677

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (calcium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1530	Mean	26202
Maximum	50900	Median	31100
SD	21614	Std. Error of Mean	5995
Coefficient of Variation	0.825	Skewness	-0.0614

Normal GOF Test

Shapiro Wilk Test Statistic	0.804	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.21	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	36886	95% Adjusted-CLT UCL (Chen-1995)	35953
		95% Modified-t UCL (Johnson-1978)	36869

Gamma GOF Test

A-D Test Statistic	1.069	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.244	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.244	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.89	k star (bias corrected MLE)	0.736
Theta hat (MLE)	29443	Theta star (bias corrected MLE)	35609
nu hat (MLE)	23.14	nu star (bias corrected)	19.13
MLE Mean (bias corrected)	26202	MLE Sd (bias corrected)	30545
		Approximate Chi Square Value (0.05)	10.21
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	9.297

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	49080	95% Adjusted Gamma UCL (use when n<50)	53917

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.809	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.866	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.258	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.333	Mean of logged Data	9.516
Maximum of Logged Data	10.84	SD of logged Data	1.429

Assuming Lognormal Distribution

95% H-UCL	169577	90% Chebyshev (MVUE) UCL	76490
95% Chebyshev (MVUE) UCL	96200	97.5% Chebyshev (MVUE) UCL	123556
99% Chebyshev (MVUE) UCL	177293		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	36062	95% Jackknife UCL	36886
95% Standard Bootstrap UCL	35772	95% Bootstrap-t UCL	36617
95% Hall's Bootstrap UCL	34812	95% Percentile Bootstrap UCL	35764
95% BCA Bootstrap UCL	35472		
90% Chebyshev(Mean, Sd) UCL	44186	95% Chebyshev(Mean, Sd) UCL	52332
97.5% Chebyshev(Mean, Sd) UCL	63638	99% Chebyshev(Mean, Sd) UCL	85848

Suggested UCL to Use

95% Student's-t UCL	36886

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Result (chromium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	7.1	Mean	17.31
Maximum	51.7	Median	13.4
SD	11.81	Std. Error of Mean	3.276
Coefficient of Variation	0.682	Skewness	2.367

Normal GOF Test

Shapiro Wilk Test Statistic	0.721	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.307	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	23.15	95% Adjusted-CLT UCL (Chen-1995)	24.99
		95% Modified-t UCL (Johnson-1978)	23.5

Gamma GOF Test

A-D Test Statistic	0.724	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.247	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.238	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.523	k star (bias corrected MLE)	2.761
Theta hat (MLE)	4.912	Theta star (bias corrected MLE)	6.268
nu hat (MLE)	91.6	nu star (bias corrected)	71.8
MLE Mean (bias corrected)	17.31	MLE Sd (bias corrected)	10.42
		Approximate Chi Square Value (0.05)	53.29
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	51.02

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	23.32	95% Adjusted Gamma UCL (use when n<50)	24.36

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.921	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.96	Mean of logged Data	2.703
Maximum of Logged Data	3.945	SD of logged Data	0.528

Assuming Lognormal Distribution

95% H-UCL	23.78	90% Chebyshev (MVUE) UCL	24.6
95% Chebyshev (MVUE) UCL	28.07	97.5% Chebyshev (MVUE) UCL	32.88
99% Chebyshev (MVUE) UCL	42.34		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	22.7	95% Jackknife UCL	23.15
95% Standard Bootstrap UCL	22.44	95% Bootstrap-t UCL	31.95
95% Hall's Bootstrap UCL	47.59	95% Percentile Bootstrap UCL	22.79
95% BCA Bootstrap UCL	24.99		
90% Chebyshev(Mean, Sd) UCL	27.13	95% Chebyshev(Mean, Sd) UCL	31.59
97.5% Chebyshev(Mean, Sd) UCL	37.76	99% Chebyshev(Mean, Sd) UCL	49.9

Suggested UCL to Use

95% Adjusted Gamma UCL	24.36

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (chrysene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	8	Number of Non-Detects	5
Number of Distinct Detects	8	Number of Distinct Non-Detects	5
Minimum Detect	0.00364	Minimum Non-Detect	0.081
Maximum Detect	0.286	Maximum Non-Detect	0.16
Variance Detects	0.0117	Percent Non-Detects	38.46%
Mean Detects	0.0684	SD Detects	0.108
Median Detects	0.0144	CV Detects	1.581
Skewness Detects	1.652	Kurtosis Detects	1.435
Mean of Logged Detects	-3.859	SD of Logged Detects	1.612

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.662	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.408	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0466	KM Standard Error of Mean	0.025
KM SD	0.0842	95% KM (BCA) UCL	0.0937
95% KM (t) UCL	0.0912	95% KM (Percentile Bootstrap) UCL	0.0905
95% KM (z) UCL	0.0878	95% KM Bootstrap t UCL	0.357
90% KM Chebyshev UCL	0.122	95% KM Chebyshev UCL	0.156

97.5% KM Chebyshev UCL	0.203	99% KM Chebyshev UCL	0.296

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.808	Anderson-Darling GOF Test
5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.315	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.308	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.534	k star (bias corrected MLE)	0.417
Theta hat (MLE)	0.128	Theta star (bias corrected MLE)	0.164
nu hat (MLE)	8.547	nu star (bias corrected)	6.675
Mean (detects)	0.0684		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00364	Mean	0.046
Maximum	0.286	Median	0.01
SD	0.0878	CV	1.91
k hat (MLE)	0.582	k star (bias corrected MLE)	0.499
Theta hat (MLE)	0.0789	Theta star (bias corrected MLE)	0.0921
nu hat (MLE)	15.14	nu star (bias corrected)	12.98
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (12.98, α)	5.878	Adjusted Chi Square Value (12.98, β)	5.212
95% Gamma Approximate UCL (use when n>=50)	0.101	95% Gamma Adjusted UCL (use when n<50)	0.114

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0466	SD (KM)	0.0842
Variance (KM)	0.00709	SE of Mean (KM)	0.025
k hat (KM)	0.307	k star (KM)	0.287
nu hat (KM)	7.976	nu star (KM)	7.469
theta hat (KM)	0.152	theta star (KM)	0.162
80% gamma percentile (KM)	0.0707	90% gamma percentile (KM)	0.138
95% gamma percentile (KM)	0.216	99% gamma percentile (KM)	0.42

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (7.47, α)	2.431	Adjusted Chi Square Value (7.47, β)	2.042
95% Gamma Approximate KM-UCL (use when n>=50)	0.143	95% Gamma Adjusted KM-UCL (use when n<50)	0.171

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.882	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.214	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0465	Mean in Log Scale	-4.099
SD in Original Scale	0.0876	SD in Log Scale	1.271

95% t UCL (assumes normality of ROS data)	0.0897	95% Percentile Bootstrap UCL	0.0887
95% BCA Bootstrap UCL	0.11	95% Bootstrap t UCL	0.624
95% H-UCL (Log ROS)	0.127		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.167	KM Geo Mean	0.0155
KM SD (logged)	1.313	95% Critical H Value (KM-Log)	3.418
KM Standard Error of Mean (logged)	0.423	95% H-UCL (KM -Log)	0.134
KM SD (logged)	1.313	95% Critical H Value (KM-Log)	3.418
KM Standard Error of Mean (logged)	0.423		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0641	Mean in Log Scale	-3.491
SD in Original Scale	0.0836	SD in Log Scale	1.336
95% t UCL (Assumes normality)	0.105	95% H-Stat UCL	0.282

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	0.203	99% KM (Chebyshev) UCL	0.296

Warning: Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (cobalt)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	10	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	3
Minimum Detect	7.6	Minimum Non-Detect	6
Maximum Detect	43.2	Maximum Non-Detect	13
Variance Detects	111.3	Percent Non-Detects	23.08%
Mean Detects	13.45	SD Detects	10.55
Median Detects	10.35	CV Detects	0.784
Skewness Detects	3.055	Kurtosis Detects	9.506
Mean of Logged Detects	2.453	SD of Logged Detects	0.483

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.497	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.428	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	12.06	KM Standard Error of Mean	2.692
KM SD	9.184	95% KM (BCA) UCL	17.58

95% KM (t) UCL	16.86	95% KM (Percentile Bootstrap) UCL	17.07
95% KM (z) UCL	16.49	95% KM Bootstrap t UCL	28.22
90% KM Chebyshev UCL	20.13	95% KM Chebyshev UCL	23.79
97.5% KM Chebyshev UCL	28.87	99% KM Chebyshev UCL	38.84

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.814	Anderson-Darling GOF Test
5% A-D Critical Value	0.731	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.372	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.268	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.575	k star (bias corrected MLE)	2.569
Theta hat (MLE)	3.762	Theta star (bias corrected MLE)	5.235
nu hat (MLE)	71.5	nu star (bias corrected)	51.39
Mean (detects)	13.45		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11.06
Maximum	43.2	Median	9.9
SD	10.39	CV	0.939
k hat (MLE)	0.806	k star (bias corrected MLE)	0.671
Theta hat (MLE)	13.72	Theta star (bias corrected MLE)	16.47
nu hat (MLE)	20.96	nu star (bias corrected)	17.46
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (17.46, α)	9	Adjusted Chi Square Value (17.46, β)	8.147
95% Gamma Approximate UCL (use when n>=50)	21.46	95% Gamma Adjusted UCL (use when n<50)	23.7

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	12.06	SD (KM)	9.184
Variance (KM)	84.35	SE of Mean (KM)	2.692
k hat (KM)	1.724	k star (KM)	1.377
nu hat (KM)	44.82	nu star (KM)	35.81
theta hat (KM)	6.995	theta star (KM)	8.755
80% gamma percentile (KM)	18.83	90% gamma percentile (KM)	25.66
95% gamma percentile (KM)	32.33	99% gamma percentile (KM)	47.47

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (35.81, α)	23.12	Adjusted Chi Square Value (35.81, β)	21.67
95% Gamma Approximate KM-UCL (use when n>=50)	18.68	95% Gamma Adjusted KM-UCL (use when n<50)	19.93

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.659	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.33	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	11.82	Mean in Log Scale	2.302
SD in Original Scale	9.708	SD in Log Scale	0.532
95% t UCL (assumes normality of ROS data)	16.62	95% Percentile Bootstrap UCL	16.92
95% BCA Bootstrap UCL	19.02	95% Bootstrap t UCL	26.19
95% H-UCL (Log ROS)	16.03		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.342	KM Geo Mean	10.41
KM SD (logged)	0.463	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.137	95% H-UCL (KM -Log)	15.29
KM SD (logged)	0.463	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.137		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	11.38	Mean in Log Scale	2.221
SD in Original Scale	9.974	SD in Log Scale	0.628
95% t UCL (Assumes normality)	16.31	95% H-Stat UCL	16.95

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	16.86	KM H-UCL	15.29
95% KM (BCA) UCL	17.58		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (copper)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	7.4	Mean	37.02
Maximum	141	Median	29.2
SD	34.2	Std. Error of Mean	9.486
Coefficient of Variation	0.924	Skewness	2.61

Normal GOF Test

Shapiro Wilk Test Statistic	0.705	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.243	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	53.92	95% Adjusted-CLT UCL (Chen-1995)	59.96

95% Modified-t UCL (Johnson-1978)	55.07

Gamma GOF Test

A-D Test Statistic	0.381	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.24	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.884	k star (bias corrected MLE)	1.501
Theta hat (MLE)	19.65	Theta star (bias corrected MLE)	24.67
nu hat (MLE)	48.99	nu star (bias corrected)	39.02
MLE Mean (bias corrected)	37.02	MLE Sd (bias corrected)	30.22
		Approximate Chi Square Value (0.05)	25.71
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	24.18

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	56.18	95% Adjusted Gamma UCL (use when n<50)	59.73

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.123	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.001	Mean of logged Data	3.323
Maximum of Logged Data	4.949	SD of logged Data	0.781

Assuming Lognormal Distribution

95% H-UCL	65.99	90% Chebyshev (MVUE) UCL	61.64
95% Chebyshev (MVUE) UCL	73	97.5% Chebyshev (MVUE) UCL	88.76
99% Chebyshev (MVUE) UCL	119.7		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	52.62	95% Jackknife UCL	53.92
95% Standard Bootstrap UCL	52.12	95% Bootstrap-t UCL	72.38
95% Hall's Bootstrap UCL	121.3	95% Percentile Bootstrap UCL	53.65
95% BCA Bootstrap UCL	62.6		
90% Chebyshev(Mean, Sd) UCL	65.47	95% Chebyshev(Mean, Sd) UCL	78.36
97.5% Chebyshev(Mean, Sd) UCL	96.25	99% Chebyshev(Mean, Sd) UCL	131.4

Suggested UCL to Use

95% Adjusted Gamma UCL	59.73

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (fluoranthene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	8	Number of Non-Detects	5
Number of Distinct Detects	8	Number of Distinct Non-Detects	5
Minimum Detect	0.00491	Minimum Non-Detect	0.081
Maximum Detect	0.364	Maximum Non-Detect	0.16
Variance Detects	0.0185	Percent Non-Detects	38.46%
Mean Detects	0.0862	SD Detects	0.136
Median Detects	0.0182	CV Detects	1.577
Skewness Detects	1.699	Kurtosis Detects	1.723
Mean of Logged Detects	-3.572	SD of Logged Detects	1.558

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.66	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.41	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.059	KM Standard Error of Mean	0.0314
KM SD	0.106	95% KM (BCA) UCL	0.118
95% KM (t) UCL	0.115	95% KM (Percentile Bootstrap) UCL	0.113
95% KM (z) UCL	0.111	95% KM Bootstrap t UCL	0.496
90% KM Chebyshev UCL	0.153	95% KM Chebyshev UCL	0.196
97.5% KM Chebyshev UCL	0.255	99% KM Chebyshev UCL	0.371

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.836	Anderson-Darling GOF Test
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.327	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.308	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.557	k star (bias corrected MLE)	0.432
Theta hat (MLE)	0.155	Theta star (bias corrected MLE)	0.2
nu hat (MLE)	8.917	nu star (bias corrected)	6.906
Mean (detects)	0.0862		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00491	Mean	0.0569
Maximum	0.364	Median	0.01
SD	0.111	CV	1.947
k hat (MLE)	0.565	k star (bias corrected MLE)	0.486
Theta hat (MLE)	0.101	Theta star (bias corrected MLE)	0.117

nu hat (MLE)	14.7	nu star (bias corrected)	12.64
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (12.64, α)	5.651	Adjusted Chi Square Value (12.64, β)	5.001
95% Gamma Approximate UCL (use when n>=50)	0.127	95% Gamma Adjusted UCL (use when n<50)	0.144

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.059	SD (KM)	0.106
Variance (KM)	0.0112	SE of Mean (KM)	0.0314
k hat (KM)	0.311	k star (KM)	0.291
nu hat (KM)	8.098	nu star (KM)	7.563
theta hat (KM)	0.189	theta star (KM)	0.203
80% gamma percentile (KM)	0.0897	90% gamma percentile (KM)	0.174
95% gamma percentile (KM)	0.272	99% gamma percentile (KM)	0.528

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (7.56, α)	2.484	Adjusted Chi Square Value (7.56, β)	2.09
95% Gamma Approximate KM-UCL (use when n>=50)	0.179	95% Gamma Adjusted KM-UCL (use when n<50)	0.213

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.881	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.231	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0589	Mean in Log Scale	-3.804
SD in Original Scale	0.11	SD in Log Scale	1.228
95% t UCL (assumes normality of ROS data)	0.113	95% Percentile Bootstrap UCL	0.114
95% BCA Bootstrap UCL	0.129	95% Bootstrap t UCL	0.834
95% H-UCL (Log ROS)	0.15		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.872	KM Geo Mean	0.0208
KM SD (logged)	1.264	95% Critical H Value (KM-Log)	3.326
KM Standard Error of Mean (logged)	0.405	95% H-UCL (KM -Log)	0.156
KM SD (logged)	1.264	95% Critical H Value (KM-Log)	3.326
KM Standard Error of Mean (logged)	0.405		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.075	Mean in Log Scale	-3.315
SD in Original Scale	0.105	SD in Log Scale	1.251
95% t UCL (Assumes normality)	0.127	95% H-Stat UCL	0.262

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	0.255	99% KM (Chebyshev) UCL	0.371

Warning: Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (indeno(1,2,3-cd)pyrene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	6	Number of Non-Detects	7
Number of Distinct Detects	6	Number of Distinct Non-Detects	7
Minimum Detect	0.00583	Minimum Non-Detect	0.0037
Maximum Detect	0.0976	Maximum Non-Detect	0.59
Variance Detects	0.00124	Percent Non-Detects	53.85%
Mean Detects	0.0262	SD Detects	0.0352
Median Detects	0.0142	CV Detects	1.344
Skewness Detects	2.372	Kurtosis Detects	5.713
Mean of Logged Detects	-4.139	SD of Logged Detects	0.974

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.61	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.436	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0193	KM Standard Error of Mean	0.00926
KM SD	0.0265	95% KM (BCA) UCL	0.04
95% KM (t) UCL	0.0358	95% KM (Percentile Bootstrap) UCL	0.0353
95% KM (z) UCL	0.0345	95% KM Bootstrap t UCL	0.0742
90% KM Chebyshev UCL	0.047	95% KM Chebyshev UCL	0.0596
97.5% KM Chebyshev UCL	0.0771	99% KM Chebyshev UCL	0.111

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.783	Anderson-Darling GOF Test
5% A-D Critical Value	0.713	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.376	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.34	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.143	k star (bias corrected MLE)	0.683
Theta hat (MLE)	0.0229	Theta star (bias corrected MLE)	0.0384
nu hat (MLE)	13.72	nu star (bias corrected)	8.191
Mean (detects)	0.0262		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00583	Mean	0.0175
Maximum	0.0976	Median	0.01

SD	0.0242	CV	1.387
k hat (MLE)	1.602	k star (bias corrected MLE)	1.284
Theta hat (MLE)	0.0109	Theta star (bias corrected MLE)	0.0136
nu hat (MLE)	41.66	nu star (bias corrected)	33.38
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (33.38, α)	21.17	Adjusted Chi Square Value (33.38, β)	19.79
95% Gamma Approximate UCL (use when n>=50)	0.0276	95% Gamma Adjusted UCL (use when n<50)	0.0295

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0193	SD (KM)	0.0265
Variance (KM)	7.0330E-4	SE of Mean (KM)	0.00926
k hat (KM)	0.527	k star (KM)	0.457
nu hat (KM)	13.71	nu star (KM)	11.88
theta hat (KM)	0.0365	theta star (KM)	0.0421
80% gamma percentile (KM)	0.0315	90% gamma percentile (KM)	0.0531
95% gamma percentile (KM)	0.0764	99% gamma percentile (KM)	0.134

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (11.88, α)	5.15	Adjusted Chi Square Value (11.88, β)	4.534
95% Gamma Approximate KM-UCL (use when n>=50)	0.0444	95% Gamma Adjusted KM-UCL (use when n<50)	0.0505

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.859	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.307	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0169	Mean in Log Scale	-4.515
SD in Original Scale	0.0245	SD in Log Scale	0.847
95% t UCL (assumes normality of ROS data)	0.029	95% Percentile Bootstrap UCL	0.0298
95% BCA Bootstrap UCL	0.0369	95% Bootstrap t UCL	0.0778
95% H-UCL (Log ROS)	0.0295		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.449	KM Geo Mean	0.0117
KM SD (logged)	0.878	95% Critical H Value (KM-Log)	2.643
KM Standard Error of Mean (logged)	0.33	95% H-UCL (KM -Log)	0.0336
KM SD (logged)	0.878	95% Critical H Value (KM-Log)	2.643
KM Standard Error of Mean (logged)	0.33		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0569	Mean in Log Scale	-3.605
SD in Original Scale	0.078	SD in Log Scale	1.361
95% t UCL (Assumes normality)	0.0955	95% H-Stat UCL	0.273

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	0.0336

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (iron)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	12000	Mean	40023
Maximum	125000	Median	36500
SD	29514	Std. Error of Mean	8186
Coefficient of Variation	0.737	Skewness	2.104

Normal GOF Test

Shapiro Wilk Test Statistic	0.765	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.273	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	54613	95% Adjusted-CLT UCL (Chen-1995)	58593
		95% Modified-t UCL (Johnson-1978)	55409

Gamma GOF Test

A-D Test Statistic	0.604	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.208	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.239	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.511	k star (bias corrected MLE)	1.983
Theta hat (MLE)	15940	Theta star (bias corrected MLE)	20185
nu hat (MLE)	65.28	nu star (bias corrected)	51.55
MLE Mean (bias corrected)	40023	MLE Sd (bias corrected)	28423
		Approximate Chi Square Value (0.05)	36.06
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	34.22

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	57215	95% Adjusted Gamma UCL (use when n<50)	60290

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.909	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.251	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.393	Mean of logged Data	10.39
Maximum of Logged Data	11.74	SD of logged Data	0.679

Assuming Lognormal Distribution

95% H-UCL	64542	90% Chebyshev (MVUE) UCL	63501
95% Chebyshev (MVUE) UCL	74177	97.5% Chebyshev (MVUE) UCL	88995
99% Chebyshev (MVUE) UCL	118102		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	53488	95% Jackknife UCL	54613
95% Standard Bootstrap UCL	52973	95% Bootstrap-t UCL	61886
95% Hall's Bootstrap UCL	120717	95% Percentile Bootstrap UCL	53715
95% BCA Bootstrap UCL	58923		
90% Chebyshev(Mean, Sd) UCL	64581	95% Chebyshev(Mean, Sd) UCL	75704
97.5% Chebyshev(Mean, Sd) UCL	91143	99% Chebyshev(Mean, Sd) UCL	121471

Suggested UCL to Use

95% Adjusted Gamma UCL	60290

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (lead)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	4.5	Mean	55.27
Maximum	384	Median	25.9
SD	101.2	Std. Error of Mean	28.06
Coefficient of Variation	1.83	Skewness	3.32

Normal GOF Test

Shapiro Wilk Test Statistic	0.499	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.364	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	105.3	95% Adjusted-CLT UCL (Chen-1995)	129
		95% Modified-t UCL (Johnson-1978)	109.6

Gamma GOF Test

A-D Test Statistic	0.817	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.771	Data Not Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.235	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.742	k star (bias corrected MLE)	0.622
Theta hat (MLE)	74.46	Theta star (bias corrected MLE)	88.82
nu hat (MLE)	19.3	nu star (bias corrected)	16.18
MLE Mean (bias corrected)	55.27	MLE Sd (bias corrected)	70.06
		Approximate Chi Square Value (0.05)	8.089
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	7.287

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	110.6	95% Adjusted Gamma UCL (use when n<50)	122.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.145	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.504	Mean of logged Data	3.205
Maximum of Logged Data	5.951	SD of logged Data	1.211

Assuming Lognormal Distribution

95% H-UCL	158.6	90% Chebyshev (MVUE) UCL	99.14
95% Chebyshev (MVUE) UCL	122.7	97.5% Chebyshev (MVUE) UCL	155.4
99% Chebyshev (MVUE) UCL	219.7		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	101.4	95% Jackknife UCL	105.3
95% Standard Bootstrap UCL	99.24	95% Bootstrap-t UCL	247.2
95% Hall's Bootstrap UCL	262.1	95% Percentile Bootstrap UCL	108.3
95% BCA Bootstrap UCL	140.1		
90% Chebyshev(Mean, Sd) UCL	139.4	95% Chebyshev(Mean, Sd) UCL	177.6
97.5% Chebyshev(Mean, Sd) UCL	230.5	99% Chebyshev(Mean, Sd) UCL	334.5

Suggested UCL to Use

95% Adjusted Gamma UCL	122.7

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (magnesium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1410	Mean	4792
Maximum	14100	Median	5170
SD	3349	Std. Error of Mean	928.9
Coefficient of Variation	0.699	Skewness	1.876

Normal GOF Test

Shapiro Wilk Test Statistic	0.803	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.182	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	6448	95% Adjusted-CLT UCL (Chen-1995)	6837
		95% Modified-t UCL (Johnson-1978)	6529

Gamma GOF Test

A-D Test Statistic	0.461	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.167	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.238	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.772	k star (bias corrected MLE)	2.184
Theta hat (MLE)	1729	Theta star (bias corrected MLE)	2195
nu hat (MLE)	72.08	nu star (bias corrected)	56.78
MLE Mean (bias corrected)	4792	MLE Sd (bias corrected)	3243
		Approximate Chi Square Value (0.05)	40.46
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	38.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6725	95% Adjusted Gamma UCL (use when n<50)	7067

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.201	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.251	Mean of logged Data	8.284
Maximum of Logged Data	9.554	SD of logged Data	0.636

Assuming Lognormal Distribution

95% H-UCL	7364	90% Chebyshev (MVUE) UCL	7375
95% Chebyshev (MVUE) UCL	8560	97.5% Chebyshev (MVUE) UCL	10204

99% Chebyshev (MVUE) UCL	13435

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6320	95% Jackknife UCL	6448
95% Standard Bootstrap UCL	6269	95% Bootstrap-t UCL	7464
95% Hall's Bootstrap UCL	13201	95% Percentile Bootstrap UCL	6286
95% BCA Bootstrap UCL	6860		
90% Chebyshev(Mean, Sd) UCL	7579	95% Chebyshev(Mean, Sd) UCL	8841
97.5% Chebyshev(Mean, Sd) UCL	10594	99% Chebyshev(Mean, Sd) UCL	14035

Suggested UCL to Use

95% Student's-t UCL	6448

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (manganese)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	168	Mean	492.8
Maximum	3170	Median	258
SD	806.5	Std. Error of Mean	223.7
Coefficient of Variation	1.637	Skewness	3.572

Normal GOF Test

Shapiro Wilk Test Statistic	0.377	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.469	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	891.5	95% Adjusted-CLT UCL (Chen-1995)	1098
		95% Modified-t UCL (Johnson-1978)	928.4

Gamma GOF Test

A-D Test Statistic	2.872	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.395	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.242	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.291	k star (bias corrected MLE)	1.044
Theta hat (MLE)	381.8	Theta star (bias corrected MLE)	472
nu hat (MLE)	33.55	nu star (bias corrected)	27.14
MLE Mean (bias corrected)	492.8	MLE Sd (bias corrected)	482.3
		Approximate Chi Square Value (0.05)	16.26
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	15.07

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	822.5	95% Adjusted Gamma UCL (use when n<50)	887.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.604	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.321	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.124	Mean of logged Data	5.765
Maximum of Logged Data	8.061	SD of logged Data	0.724

Assuming Lognormal Distribution

95% H-UCL	684.8	90% Chebyshev (MVUE) UCL	659.9
95% Chebyshev (MVUE) UCL	775.6	97.5% Chebyshev (MVUE) UCL	936.2
99% Chebyshev (MVUE) UCL	1252		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	860.7	95% Jackknife UCL	891.5
95% Standard Bootstrap UCL	834.5	95% Bootstrap-t UCL	4744
95% Hall's Bootstrap UCL	3063	95% Percentile Bootstrap UCL	932.4
95% BCA Bootstrap UCL	1172		
90% Chebyshev(Mean, Sd) UCL	1164	95% Chebyshev(Mean, Sd) UCL	1468
97.5% Chebyshev(Mean, Sd) UCL	1890	99% Chebyshev(Mean, Sd) UCL	2719

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	1468

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (mercury)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	9	Number of Non-Detects	4
Number of Distinct Detects	9	Number of Distinct Non-Detects	3
Minimum Detect	0.039	Minimum Non-Detect	0.04
Maximum Detect	0.5	Maximum Non-Detect	0.047

Variance Detects	0.021	Percent Non-Detects	30.77%
Mean Detects	0.129	SD Detects	0.145
Median Detects	0.083	CV Detects	1.124
Skewness Detects	2.592	Kurtosis Detects	7.131
Mean of Logged Detects	-2.401	SD of Logged Detects	0.806

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.634	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.303	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.101	KM Standard Error of Mean	0.0355
KM SD	0.121	95% KM (BCA) UCL	0.163
95% KM (t) UCL	0.165	95% KM (Percentile Bootstrap) UCL	0.165
95% KM (z) UCL	0.16	95% KM Bootstrap t UCL	0.29
90% KM Chebyshev UCL	0.208	95% KM Chebyshev UCL	0.256
97.5% KM Chebyshev UCL	0.323	99% KM Chebyshev UCL	0.455

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.692	Anderson-Darling GOF Test
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.221	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.57	k star (bias corrected MLE)	1.121
Theta hat (MLE)	0.082	Theta star (bias corrected MLE)	0.115
nu hat (MLE)	28.26	nu star (bias corrected)	20.17
Mean (detects)	0.129		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0922
Maximum	0.5	Median	0.044
SD	0.131	CV	1.423
k hat (MLE)	0.847	k star (bias corrected MLE)	0.703
Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.131
nu hat (MLE)	22.02	nu star (bias corrected)	18.27
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (18.27, α)	9.588	Adjusted Chi Square Value (18.27, β)	8.704
95% Gamma Approximate UCL (use when n>=50)	0.176	95% Gamma Adjusted UCL (use when n<50)	0.194

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.101	SD (KM)	0.121
Variance (KM)	0.0146	SE of Mean (KM)	0.0355
k hat (KM)	0.703	k star (KM)	0.592

nu hat (KM)	18.28	nu star (KM)	15.39
theta hat (KM)	0.144	theta star (KM)	0.171
80% gamma percentile (KM)	0.167	90% gamma percentile (KM)	0.264
95% gamma percentile (KM)	0.366	99% gamma percentile (KM)	0.613

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (15.39, α)	7.536	Adjusted Chi Square Value (15.39, β)	6.766
95% Gamma Approximate KM-UCL (use when n>=50)	0.207	95% Gamma Adjusted KM-UCL (use when n<50)	0.23

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.891	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0977	Mean in Log Scale	-2.774
SD in Original Scale	0.128	SD in Log Scale	0.888
95% t UCL (assumes normality of ROS data)	0.161	95% Percentile Bootstrap UCL	0.163
95% BCA Bootstrap UCL	0.199	95% Bootstrap t UCL	0.285
95% H-UCL (Log ROS)	0.183		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-2.657	KM Geo Mean	0.0702
KM SD (logged)	0.74	95% Critical H Value (KM-Log)	2.429
KM Standard Error of Mean (logged)	0.218	95% H-UCL (KM -Log)	0.155
KM SD (logged)	0.74	95% Critical H Value (KM-Log)	2.429
KM Standard Error of Mean (logged)	0.218		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0957	Mean in Log Scale	-2.85
SD in Original Scale	0.129	SD in Log Scale	0.962
95% t UCL (Assumes normality)	0.159	95% H-Stat UCL	0.199

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	0.23	95% GROS Adjusted Gamma UCL	0.194

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (methyl acetate)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	11
Number of Detects	6	Number of Non-Detects	7
Number of Distinct Detects	6	Number of Distinct Non-Detects	6

Minimum Detect	0.008	Minimum Non-Detect	0.0048
Maximum Detect	0.174	Maximum Non-Detect	0.017
Variance Detects	0.00335	Percent Non-Detects	53.85%
Mean Detects	0.0693	SD Detects	0.0579
Median Detects	0.0579	CV Detects	0.836
Skewness Detects	1.336	Kurtosis Detects	2.243
Mean of Logged Detects	-3.031	SD of Logged Detects	1.044

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.902	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.233	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0346	KM Standard Error of Mean	0.0146
KM SD	0.0481	95% KM (BCA) UCL	0.0598
95% KM (t) UCL	0.0607	95% KM (Percentile Bootstrap) UCL	0.0594
95% KM (z) UCL	0.0587	95% KM Bootstrap t UCL	0.0729
90% KM Chebyshev UCL	0.0785	95% KM Chebyshev UCL	0.0984
97.5% KM Chebyshev UCL	0.126	99% KM Chebyshev UCL	0.18

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.185	Anderson-Darling GOF Test
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.139	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.337	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.529	k star (bias corrected MLE)	0.876
Theta hat (MLE)	0.0453	Theta star (bias corrected MLE)	0.0791
nu hat (MLE)	18.35	nu star (bias corrected)	10.51
Mean (detects)	0.0693		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.008	Mean	0.0373
Maximum	0.174	Median	0.01
SD	0.0484	CV	1.296
k hat (MLE)	0.979	k star (bias corrected MLE)	0.804
Theta hat (MLE)	0.0382	Theta star (bias corrected MLE)	0.0464
nu hat (MLE)	25.45	nu star (bias corrected)	20.91
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (20.91, α)	11.52	Adjusted Chi Square Value (20.91, β)	10.54
95% Gamma Approximate UCL (use when n>=50)	0.0678	95% Gamma Adjusted UCL (use when n<50)	0.0741

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0346	SD (KM)	0.0481

Variance (KM)	0.00232	SE of Mean (KM)	0.0146
k hat (KM)	0.517	k star (KM)	0.449
nu hat (KM)	13.45	nu star (KM)	11.68
theta hat (KM)	0.0669	theta star (KM)	0.0771
80% gamma percentile (KM)	0.0565	90% gamma percentile (KM)	0.0957
95% gamma percentile (KM)	0.138	99% gamma percentile (KM)	0.244

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (11.68, α)	5.019	Adjusted Chi Square Value (11.68, β)	4.412
95% Gamma Approximate KM-UCL (use when n>=50)	0.0806	95% Gamma Adjusted KM-UCL (use when n<50)	0.0917

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.948	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.2	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0335	Mean in Log Scale	-4.597
SD in Original Scale	0.0509	SD in Log Scale	1.672
95% t UCL (assumes normality of ROS data)	0.0586	95% Percentile Bootstrap UCL	0.0587
95% BCA Bootstrap UCL	0.0661	95% Bootstrap t UCL	0.0806
95% H-UCL (Log ROS)	0.294		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.261	KM Geo Mean	0.0141
KM SD (logged)	1.312	95% Critical H Value (KM-Log)	3.417
KM Standard Error of Mean (logged)	0.4	95% H-UCL (KM -Log)	0.122
KM SD (logged)	1.312	95% Critical H Value (KM-Log)	3.417
KM Standard Error of Mean (logged)	0.4		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0344	Mean in Log Scale	-4.351
SD in Original Scale	0.0503	SD in Log Scale	1.464
95% t UCL (Assumes normality)	0.0592	95% H-Stat UCL	0.18

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 0.0607

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (nickel)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13

Number of Detects	12	Number of Non-Detects	1
Number of Distinct Detects	12	Number of Distinct Non-Detects	1
Minimum Detect	10.4	Minimum Non-Detect	10
Maximum Detect	82.9	Maximum Non-Detect	10
Variance Detects	381.2	Percent Non-Detects	7.692%
Mean Detects	21.63	SD Detects	19.52
Median Detects	16.45	CV Detects	0.903
Skewness Detects	3.321	Kurtosis Detects	11.29
Mean of Logged Detects	2.896	SD of Logged Detects	0.517

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.474	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.417	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	20.73	KM Standard Error of Mean	5.279
KM SD	18.22	95% KM (BCA) UCL	31.25
95% KM (t) UCL	30.14	95% KM (Percentile Bootstrap) UCL	30.89
95% KM (z) UCL	29.41	95% KM Bootstrap t UCL	61.2
90% KM Chebyshev UCL	36.57	95% KM Chebyshev UCL	43.74
97.5% KM Chebyshev UCL	53.7	99% KM Chebyshev UCL	73.26

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.95	Anderson-Darling GOF Test
5% A-D Critical Value	0.739	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.34	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.247	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.972	k star (bias corrected MLE)	2.285
Theta hat (MLE)	7.276	Theta star (bias corrected MLE)	9.465
nu hat (MLE)	71.33	nu star (bias corrected)	54.83
Mean (detects)	21.63		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	19.96
Maximum	82.9	Median	16.2
SD	19.63	CV	0.983
k hat (MLE)	0.87	k star (bias corrected MLE)	0.721
Theta hat (MLE)	22.94	Theta star (bias corrected MLE)	27.7
nu hat (MLE)	22.63	nu star (bias corrected)	18.74
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (18.74, α)	9.927	Adjusted Chi Square Value (18.74, β)	9.025
95% Gamma Approximate UCL (use when n>=50)	37.68	95% Gamma Adjusted UCL (use when n<50)	41.45

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	20.73	SD (KM)	18.22
Variance (KM)	332.1	SE of Mean (KM)	5.279
k hat (KM)	1.294	k star (KM)	1.047
nu hat (KM)	33.64	nu star (KM)	27.21
theta hat (KM)	16.02	theta star (KM)	19.81
80% gamma percentile (KM)	33.24	90% gamma percentile (KM)	47.2
95% gamma percentile (KM)	61.11	99% gamma percentile (KM)	93.31

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (27.21, α)	16.32	Adjusted Chi Square Value (27.21, β)	15.12
95% Gamma Approximate KM-UCL (use when n>=50)	34.57	95% Gamma Adjusted KM-UCL (use when n<50)	37.3

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.696	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.283	Lilliefors GOF Test
5% Lilliefors Critical Value	0.243	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	20.45	Mean in Log Scale	2.816
SD in Original Scale	19.17	SD in Log Scale	0.574
95% t UCL (assumes normality of ROS data)	29.92	95% Percentile Bootstrap UCL	30.75
95% BCA Bootstrap UCL	35.6	95% Bootstrap t UCL	53.89
95% H-UCL (Log ROS)	28.36		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.851	KM Geo Mean	17.3
KM SD (logged)	0.501	95% Critical H Value (KM-Log)	2.113
KM Standard Error of Mean (logged)	0.145	95% H-UCL (KM -Log)	26.61
KM SD (logged)	0.501	95% Critical H Value (KM-Log)	2.113
KM Standard Error of Mean (logged)	0.145		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	20.35	Mean in Log Scale	2.797
SD in Original Scale	19.25	SD in Log Scale	0.61
95% t UCL (Assumes normality)	29.86	95% H-Stat UCL	29.34

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 43.74

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (phenanthrene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	7	Number of Non-Detects	6
Number of Distinct Detects	6	Number of Distinct Non-Detects	6
Minimum Detect	0.00448	Minimum Non-Detect	0.0046
Maximum Detect	0.267	Maximum Non-Detect	0.16
Variance Detects	0.0114	Percent Non-Detects	46.15%
Mean Detects	0.0688	SD Detects	0.107
Median Detects	0.0094	CV Detects	1.554
Skewness Detects	1.495	Kurtosis Detects	0.796
Mean of Logged Detects	-3.898	SD of Logged Detects	1.642

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.669	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.419	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0403	KM Standard Error of Mean	0.0236
KM SD	0.0788	95% KM (BCA) UCL	0.0809
95% KM (t) UCL	0.0824	95% KM (Percentile Bootstrap) UCL	0.0802
95% KM (z) UCL	0.0792	95% KM Bootstrap t UCL	0.857
90% KM Chebyshev UCL	0.111	95% KM Chebyshev UCL	0.143
97.5% KM Chebyshev UCL	0.188	99% KM Chebyshev UCL	0.275

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.068	Anderson-Darling GOF Test
5% A-D Critical Value	0.75	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.407	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.327	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.518	k star (bias corrected MLE)	0.391
Theta hat (MLE)	0.133	Theta star (bias corrected MLE)	0.176
nu hat (MLE)	7.248	nu star (bias corrected)	5.475
Mean (detects)	0.0688		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00448	Mean	0.0416
Maximum	0.267	Median	0.01
SD	0.0815	CV	1.957
k hat (MLE)	0.592	k star (bias corrected MLE)	0.507
Theta hat (MLE)	0.0703	Theta star (bias corrected MLE)	0.0822
nu hat (MLE)	15.4	nu star (bias corrected)	13.18
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (13.18, α)	6.012	Adjusted Chi Square Value (13.18, β)	5.337

95% Gamma Approximate UCL (use when n>=50)	0.0913	95% Gamma Adjusted UCL (use when n<50)	0.103

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0403	SD (KM)	0.0788
Variance (KM)	0.00622	SE of Mean (KM)	0.0236
k hat (KM)	0.261	k star (KM)	0.252
nu hat (KM)	6.791	nu star (KM)	6.557
theta hat (KM)	0.154	theta star (KM)	0.16
80% gamma percentile (KM)	0.0587	90% gamma percentile (KM)	0.121
95% gamma percentile (KM)	0.195	99% gamma percentile (KM)	0.39

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (6.56, α)	1.931	Adjusted Chi Square Value (6.56, β)	1.595
95% Gamma Approximate KM-UCL (use when n>=50)	0.137	95% Gamma Adjusted KM-UCL (use when n<50)	0.166

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.77	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.352	Lilliefors GOF Test
5% Lilliefors Critical Value	0.304	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0404	Mean in Log Scale	-4.417
SD in Original Scale	0.082	SD in Log Scale	1.352
95% t UCL (assumes normality of ROS data)	0.0809	95% Percentile Bootstrap UCL	0.0803
95% BCA Bootstrap UCL	0.093	95% Bootstrap t UCL	1.215
95% H-UCL (Log ROS)	0.118		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.413	KM Geo Mean	0.0121
KM SD (logged)	1.272	95% Critical H Value (KM-Log)	3.341
KM Standard Error of Mean (logged)	0.391	95% H-UCL (KM -Log)	0.0927
KM SD (logged)	1.272	95% Critical H Value (KM-Log)	3.341
KM Standard Error of Mean (logged)	0.391		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0592	Mean in Log Scale	-3.683
SD in Original Scale	0.0784	SD in Log Scale	1.463
95% t UCL (Assumes normality)	0.098	95% H-Stat UCL	0.351

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

975% KM (Chebyshev) UCL	0.188

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (potassium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	10	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	3
Minimum Detect	205	Minimum Non-Detect	790
Maximum Detect	3740	Maximum Non-Detect	1300
Variance Detects	931361	Percent Non-Detects	23.08%
Mean Detects	1192	SD Detects	965.1
Median Detects	861.5	CV Detects	0.81
Skewness Detects	2.368	Kurtosis Detects	6.55
Mean of Logged Detects	6.85	SD of Logged Detects	0.728

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.719	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1072	KM Standard Error of Mean	250.5
KM SD	842.8	95% KM (BCA) UCL	1535
95% KM (t) UCL	1519	95% KM (Percentile Bootstrap) UCL	1486
95% KM (z) UCL	1484	95% KM Bootstrap t UCL	1936
90% KM Chebyshev UCL	1824	95% KM Chebyshev UCL	2164
97.5% KM Chebyshev UCL	2637	99% KM Chebyshev UCL	3565

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.616	Anderson-Darling GOF Test
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.196	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.301	k star (bias corrected MLE)	1.677
Theta hat (MLE)	517.8	Theta star (bias corrected MLE)	710.4
nu hat (MLE)	46.02	nu star (bias corrected)	33.55
Mean (detects)	1192		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	205	Mean	1043
Maximum	3740	Median	836
SD	886.6	CV	0.85
k hat (MLE)	2.248	k star (bias corrected MLE)	1.78
Theta hat (MLE)	463.8	Theta star (bias corrected MLE)	585.6
nu hat (MLE)	58.44	nu star (bias corrected)	46.29

Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (46.29, α)	31.68	Adjusted Chi Square Value (46.29, β)	29.96
95% Gamma Approximate UCL (use when n>=50)	1523	95% Gamma Adjusted UCL (use when n<50)	1611

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1072	SD (KM)	842.8
Variance (KM)	710332	SE of Mean (KM)	250.5
k hat (KM)	1.619	k star (KM)	1.297
nu hat (KM)	42.09	nu star (KM)	33.71
theta hat (KM)	662.4	theta star (KM)	827.1
80% gamma percentile (KM)	1685	90% gamma percentile (KM)	2316
95% gamma percentile (KM)	2935	99% gamma percentile (KM)	4345

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (33.71, α)	21.43	Adjusted Chi Square Value (33.71, β)	20.05
95% Gamma Approximate KM-UCL (use when n>=50)	1687	95% Gamma Adjusted KM-UCL (use when n<50)	1803

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.905	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.23	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1053	Mean in Log Scale	6.738
SD in Original Scale	877.9	SD in Log Scale	0.673
95% t UCL (assumes normality of ROS data)	1487	95% Percentile Bootstrap UCL	1505
95% BCA Bootstrap UCL	1705	95% Bootstrap t UCL	2040
95% H-UCL (Log ROS)	1665		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	6.742	KM Geo Mean	846.9
KM SD (logged)	0.696	95% Critical H Value (KM-Log)	2.366
KM Standard Error of Mean (logged)	0.226	95% H-UCL (KM -Log)	1737
KM SD (logged)	0.696	95% Critical H Value (KM-Log)	2.366
KM Standard Error of Mean (logged)	0.226		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1039	Mean in Log Scale	6.713
SD in Original Scale	886	SD in Log Scale	0.69
95% t UCL (Assumes normality)	1477	95% H-Stat UCL	1670

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	1803	95% GROS Adjusted Gamma UCL	1611

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (pyrene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	8	Number of Non-Detects	5
Number of Distinct Detects	8	Number of Distinct Non-Detects	5
Minimum Detect	0.00753	Minimum Non-Detect	0.081
Maximum Detect	0.526	Maximum Non-Detect	0.16
Variance Detects	0.0346	Percent Non-Detects	38.46%
Mean Detects	0.11	SD Detects	0.186
Median Detects	0.025	CV Detects	1.686
Skewness Detects	2.059	Kurtosis Detects	3.888
Mean of Logged Detects	-3.364	SD of Logged Detects	1.552

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.637	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.411	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.075	KM Standard Error of Mean	0.0427
KM SD	0.144	95% KM (BCA) UCL	0.148
95% KM (t) UCL	0.151	95% KM (Percentile Bootstrap) UCL	0.15
95% KM (z) UCL	0.145	95% KM Bootstrap t UCL	0.717
90% KM Chebyshev UCL	0.203	95% KM Chebyshev UCL	0.261
97.5% KM Chebyshev UCL	0.342	99% KM Chebyshev UCL	0.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.864	Anderson-Darling GOF Test
5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.352	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.308	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.541	k star (bias corrected MLE)	0.422
Theta hat (MLE)	0.204	Theta star (bias corrected MLE)	0.262
nu hat (MLE)	8.657	nu star (bias corrected)	6.744
Mean (detects)	0.11		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00753	Mean	0.0717
Maximum	0.526	Median	0.01
SD	0.151	CV	2.103
k hat (MLE)	0.523	k star (bias corrected MLE)	0.453

Theta hat (MLE)	0.137	Theta star (bias corrected MLE)	0.158
nu hat (MLE)	13.59	nu star (bias corrected)	11.79
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (11.79, α)	5.089	Adjusted Chi Square Value (11.79, β)	4.477
95% Gamma Approximate UCL (use when n>=50)	0.166	95% Gamma Adjusted UCL (use when n<50)	0.189

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.075	SD (KM)	0.144
Variance (KM)	0.0206	SE of Mean (KM)	0.0427
k hat (KM)	0.272	k star (KM)	0.261
nu hat (KM)	7.083	nu star (KM)	6.782
theta hat (KM)	0.275	theta star (KM)	0.288
80% gamma percentile (KM)	0.111	90% gamma percentile (KM)	0.224
95% gamma percentile (KM)	0.358	99% gamma percentile (KM)	0.713

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (6.78, α)	2.051	Adjusted Chi Square Value (6.78, β)	1.702
95% Gamma Approximate KM-UCL (use when n>=50)	0.248	95% Gamma Adjusted KM-UCL (use when n<50)	0.299

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.865	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.262	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0752	Mean in Log Scale	-3.593
SD in Original Scale	0.149	SD in Log Scale	1.223
95% t UCL (assumes normality of ROS data)	0.149	95% Percentile Bootstrap UCL	0.151
95% BCA Bootstrap UCL	0.211	95% Bootstrap t UCL	1.312
95% H-UCL (Log ROS)	0.183		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-3.664	KM Geo Mean	0.0256
KM SD (logged)	1.251	95% Critical H Value (KM-Log)	3.302
KM Standard Error of Mean (logged)	0.397	95% H-UCL (KM -Log)	0.185
KM SD (logged)	1.251	95% Critical H Value (KM-Log)	3.302
KM Standard Error of Mean (logged)	0.397		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0899	Mean in Log Scale	-3.187
SD in Original Scale	0.145	SD in Log Scale	1.222
95% t UCL (Assumes normality)	0.162	95% H-Stat UCL	0.274

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	0.342	99% KM (Chebyshev) UCL	0.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (sodium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	6	Number of Non-Detects	7
Number of Distinct Detects	6	Number of Distinct Non-Detects	7
Minimum Detect	1070	Minimum Non-Detect	570
Maximum Detect	1770	Maximum Non-Detect	3700
Variance Detects	68097	Percent Non-Detects	53.85%
Mean Detects	1348	SD Detects	261
Median Detects	1305	CV Detects	0.194
Skewness Detects	0.767	Kurtosis Detects	-0.202
Mean of Logged Detects	7.192	SD of Logged Detects	0.188

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.934	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.215	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	986.4	KM Standard Error of Mean	136.1
KM SD	415.8	95% KM (BCA) UCL	1232
95% KM (t) UCL	1229	95% KM (Percentile Bootstrap) UCL	1211
95% KM (z) UCL	1210	95% KM Bootstrap t UCL	1156
90% KM Chebyshev UCL	1395	95% KM Chebyshev UCL	1580
97.5% KM Chebyshev UCL	1836	99% KM Chebyshev UCL	2341

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.267	Anderson-Darling GOF Test
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.227	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	33.45	k star (bias corrected MLE)	16.84
Theta hat (MLE)	40.31	Theta star (bias corrected MLE)	80.08
nu hat (MLE)	401.4	nu star (bias corrected)	202
Mean (detects)	1348		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	717.6	Mean	1051
Maximum	1770	Median	1021

SD	343.1	CV	0.327
k hat (MLE)	10.96	k star (bias corrected MLE)	8.481
Theta hat (MLE)	95.86	Theta star (bias corrected MLE)	123.9
nu hat (MLE)	284.9	nu star (bias corrected)	220.5
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (220.52, α)	187.1	Adjusted Chi Square Value (220.52, β)	182.8
95% Gamma Approximate UCL (use when n>=50)	1238	95% Gamma Adjusted UCL (use when n<50)	1268

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	986.4	SD (KM)	415.8
Variance (KM)	172854	SE of Mean (KM)	136.1
k hat (KM)	5.628	k star (KM)	4.381
nu hat (KM)	146.3	nu star (KM)	113.9
theta hat (KM)	175.2	theta star (KM)	225.2
80% gamma percentile (KM)	1346	90% gamma percentile (KM)	1618
95% gamma percentile (KM)	1867	99% gamma percentile (KM)	2397

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (113.90, α)	90.26	Adjusted Chi Square Value (113.90, β)	87.27
95% Gamma Approximate KM-UCL (use when n>=50)	1245	95% Gamma Adjusted KM-UCL (use when n<50)	1287

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.952	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.205	Lilliefors GOF Test
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1090	Mean in Log Scale	6.96
SD in Original Scale	307.3	SD in Log Scale	0.263
95% t UCL (assumes normality of ROS data)	1242	95% Percentile Bootstrap UCL	1231
95% BCA Bootstrap UCL	1254	95% Bootstrap t UCL	1280
95% H-UCL (Log ROS)	1259		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	6.802	KM Geo Mean	899.7
KM SD (logged)	0.432	95% Critical H Value (KM-Log)	2.036
KM Standard Error of Mean (logged)	0.143	95% H-UCL (KM -Log)	1273
KM SD (logged)	0.432	95% Critical H Value (KM-Log)	2.036
KM Standard Error of Mean (logged)	0.143		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	960	Mean in Log Scale	6.668
SD in Original Scale	568	SD in Log Scale	0.693
95% t UCL (Assumes normality)	1241	95% H-Stat UCL	1604

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1229

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (vanadium)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	24.4	Mean	74.02
Maximum	163	Median	82.9
SD	39.46	Std. Error of Mean	10.94
Coefficient of Variation	0.533	Skewness	0.67

Normal GOF Test

Shapiro Wilk Test Statistic	0.928	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.128	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	93.52	95% Adjusted-CLT UCL (Chen-1995)	94.19
		95% Modified-t UCL (Johnson-1978)	93.86

Gamma GOF Test

A-D Test Statistic	0.402	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.238	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.537	k star (bias corrected MLE)	2.772
Theta hat (MLE)	20.93	Theta star (bias corrected MLE)	26.7
nu hat (MLE)	91.96	nu star (bias corrected)	72.07
MLE Mean (bias corrected)	74.02	MLE Sd (bias corrected)	44.45
		Approximate Chi Square Value (0.05)	53.53
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	51.25

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	99.66	95% Adjusted Gamma UCL (use when n<50)	104.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.925	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.195	Mean of logged Data	4.156
Maximum of Logged Data	5.094	SD of logged Data	0.593

Assuming Lognormal Distribution

95% H-UCL	111.4	90% Chebyshev (MVUE) UCL	113.2
95% Chebyshev (MVUE) UCL	130.5	97.5% Chebyshev (MVUE) UCL	154.6
99% Chebyshev (MVUE) UCL	201.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	92.02	95% Jackknife UCL	93.52
95% Standard Bootstrap UCL	91.42	95% Bootstrap-t UCL	96.07
95% Hall's Bootstrap UCL	97.99	95% Percentile Bootstrap UCL	92.78
95% BCA Bootstrap UCL	93.1		
90% Chebyshev(Mean, Sd) UCL	106.8	95% Chebyshev(Mean, Sd) UCL	121.7
97.5% Chebyshev(Mean, Sd) UCL	142.4	99% Chebyshev(Mean, Sd) UCL	182.9

Suggested UCL to Use

95% Student's-t UCL	93.52

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Result (zinc)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	31.2	Mean	148.8
Maximum	561	Median	102
SD	152.5	Std. Error of Mean	42.3
Coefficient of Variation	1.025	Skewness	2.021

Normal GOF Test

Shapiro Wilk Test Statistic	0.745	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.262	Lilliefors GOF Test
5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	224.2	95% Adjusted-CLT UCL (Chen-1995)	243.7
		95% Modified-t UCL (Johnson-1978)	228.1

Gamma GOF Test

A-D Test Statistic	0.497	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level

K-S Test Statistic	0.173	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.241	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.474	k star (bias corrected MLE)	1.185
Theta hat (MLE)	100.9	Theta star (bias corrected MLE)	125.5
nu hat (MLE)	38.32	nu star (bias corrected)	30.81
MLE Mean (bias corrected)	148.8	MLE Sd (bias corrected)	136.7
		Approximate Chi Square Value (0.05)	19.13
Adjusted Level of Significance	0.0301	Adjusted Chi Square Value	17.83

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	239.6	95% Adjusted Gamma UCL (use when n<50)	257.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.866	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.124	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.234	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.44	Mean of logged Data	4.626
Maximum of Logged Data	6.33	SD of logged Data	0.868

Assuming Lognormal Distribution

95% H-UCL	287.3	90% Chebyshev (MVUE) UCL	253.6
95% Chebyshev (MVUE) UCL	303.5	97.5% Chebyshev (MVUE) UCL	372.7
99% Chebyshev (MVUE) UCL	508.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	218.4	95% Jackknife UCL	224.2
95% Standard Bootstrap UCL	218.4	95% Bootstrap-t UCL	318.9
95% Hall's Bootstrap UCL	553.3	95% Percentile Bootstrap UCL	222.6
95% BCA Bootstrap UCL	248.4		
90% Chebyshev(Mean, Sd) UCL	275.7	95% Chebyshev(Mean, Sd) UCL	333.2
97.5% Chebyshev(Mean, Sd) UCL	413	99% Chebyshev(Mean, Sd) UCL	569.7

Suggested UCL to Use

95% Adjusted Gamma UCL	257.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

APPENDIX E

1,4 Dioxane EBSL Calculation

Rule 57 Aquatic Values Data Sheet

6/1/98

Chemical or product name: 1,4-Dioxane
Manufacturer (WTAs): -----
C.A.S #: 123-91-1

Developed by: Christopher Hull
Approved by: Sayler
Approval date: 6/3/98
Literature search date: CAS: 5/01/98 EEDB: 5/01/98 AQUIRE, QSAR: 5/13/98.
Clearinghouse search date: -----

FAV: 390,000 ug/l* *(Tier: II)*
AMV: 200,000 ug/l* *(Tier: II)*
FCV: 22,000 ug/l* *(Tier: II)*
Acute CF: --- *Chronic CF: ----*

ACUTE DATA

Species	Test type (EC or LC50)	Duration (hours)	Test conditions (FT,M, etc.)	Hardness mg/L	Chemical	LC50/EC50 ug/L	SMAV ug/L	GMAV ug/L	Rank	Reference
Water Flea (Ceriodaphnia dubia)	LC50	48	SR,U	60-70	-----	5,120,000	5,120,000	5,120,000	1	1
Fathead Minnow	EC50	96	FT,M	50.2	-----	9,340,000	9,444,416	9,444,416	2	2
(Pimephales promelas)	EC50	96	FT,M	45.5	-----	9,550,000				2
	LC50	96	FT,M	50.2	-----	9,850,000				2
	LC50	96	FT,M	45.5	-----	10,800,000				2
	LC50	96	S,M	616	-----	10,170,000				3

* Express value as 2 significant digits

CHRONIC DATA

Species	Test type (ELS, etc.)	Duration (days)	Study Conditions (FT,M etc.)	Hardness mg/L	Chemical	MATC ug/L	SMCV ug/L	GMCV ug/L	Rank	Reference

NO SUITABLE DATA WERE FOUND.

* Express value as 2 significant digits

1,4-DIOXANE

References Used:

1. Unnumbered: Springborn Laboratories, Inc. 1989. (1,4-Dioxane)-chronic toxicity to (Ceriodaphnia dubia) under static renewal conditions. SLI Rept. # 89-9-3089. Submitted to Gelman Sciences, Inc. 23 pp.
2. # QL638.C94A27: Geiger et al. 1990. Acute toxicities of organic chemicals to Fathead Minnows (Pimephales promelas), Vol. V. Univ. Wisc.-Superior.
3. #007838: Meier, P.G. 1986. Acute toxicity of 1,4-dioxane to Ceriodaphnia dubia and Pimephales promelas. Rept. to Gelman Sciences. 12 pp.

References Reviewed, but Not Used:

#007838: Meier, P.G. 1986. Acute toxicity of 1,4-dioxane to Ceriodaphnia dubia and Pimephales promelas. Rept. to Gelman Sciences. 12 pp.
-Ceriodaphnia data: neonates not used.
Unnumbered: Kaiser et al. 1997. Water Qual. Res. J. Can. 32 (3): 637-657.
-Secondary/QSAR data, only.
Unnumbered: Kaiser et al. 1997. Water Qual. Res. J. Can. 32 (4): 855.
-Errata to previous reference, only.
Unnumbered: Saito et al. 1993. Chemosphere 26 (5): 1015-1028.
-Inappropriate endpoint.
Unnumbered: Brandao et al. 1992. Chemosphere 25 (4): 553-562.
-Secondary data, only.
Unnumbered: Kwan et al. 1990. Environ. Pollut. 65 (4):323-332.
-No chemical-specific data.
Unnumbered: Fiedler et al. 1990. Toxicol. Environ. Chem. 28 (2-3): 167-188.
-QSAR/secondary data from AQUIRE, only.
Unnumbered: Gajghate et al. 1988.Indian J. Environ. Health 30 (3): 209-214.
-Not available at this time.
Unnumbered: Enslein et al. 1987. QSAR Environ. Toxicol. Proc. Int. Workshop, 2nd: 91-106. K.L.E. Kaiser, Ed.
011330: Bringmann and Kuhn. 1982. Z. Wasser Abwasser Forsch. 15 (1): 1-6.
-Several significant violations of ASTM standards.
Unnumbered: Nishiuchi, Y. 1981. Seitai Kagaku 4 (3): 45-47.
-Not translated at this time.
008079: Juhnke and Luedemann. 1978. Z. Wasser Abwasser Forsch. 11 (5): 161-164.
-Test species not North American.
005672: Bringmann and Kuhn. 1977. Z. Wasser Abwasser Forsch. 10 (5): 161-166.
-Test duration insufficient.
#004544: Dawson et al. 1977. J. Water Mater. 1 (4): 303-318.
-No endpoint achieved; test concentrations inadequate.
011086: Springborn Laboratories, Inc. 1989. Acute toxicity of 1,4-dioxane to Ceriodaphnids (Ceriodaphnia dubia) under static conditions. SLI Rept. # 89-6-3021. Submitted to Gelman Sciences, Inc. 20 pp.
-No LC50 achieved.
Unnumbered: Springborn Life Sciences, Inc. 1986. Acute toxicity of 1,4-dioxane to Rainbow Trout (Salmo gairdneri) under static conditions. SLI Rept. # 89-6-3103. Submitted to Gelman Sciences, Inc. 19 pp.
-No LC50 achieved.
Unnumbered: Springborn Laboratories, Inc. 1989. (1,4-Dioxane)-chronic toxicity to (Ceriodaphnia dubia) under static renewal conditions. SLI Rept. # 89-9-3089. Submitted to Gelman Sciences, Inc. 23 pp.
-Chronic data rejected because test concentrations unmeasured.

Unnumbered: Meier, P.G. 1989. Progress report on the acute and subchronic toxicity of 1,4-dioxane to *Ceriodaphnia dubia*. Rept. to Gelman Sciences, Inc. 4 pp.
-Excessive control mortality; no appropriate endpoints achieved.

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Min. data req. met	Acute Factor
$\boxed{2}$	$\boxed{13}$
3	8
4	7
5	6.1
6	5.2
7	4.3

Rule 57 Aquatic Values Work Sheet

Chemical Name: 1,4- Dioxane
C.A.S. #: 123-91-1

AQUATIC MAXIMUM VALUE CALCULATIONS

A. Minimum 8 species requirement is **not** met (Tier II). Minimum requirements met = 2
Minimum requirements missing for Tier I = 6 (i, ii, iv, v, vi, vii, viii).
Acute factor = 13

1. Toxicity **is not** dependent on a water characteristic

a. FAV calculation $FAV = \frac{\text{lowest GMAV}}{\text{Acute Factor}} = \frac{5{,}120{,}000\ \text{ug/l}}{13} = \boxed{393{,}846\ \text{ug/l.}}$

~~2. Toxicity **is** dependent on a water characteristic~~

~~a. Slope = (Table __)~~

~~b. FAV equation:~~

3. Go to C.

~~B. Minimum 8 species requirement **is** met (Tier I)~~

~~1. Toxicity **is not** dependent on a water characteristic~~

~~a. FAV calculation: Att. __~~

~~2. Toxicity **is** dependent on a water characteristic~~

~~a. Slope = (Table __)~~

~~b. Ranked genus mean acute intercepts: Table _~~

~~c. Final acute intercept = (Att. __)~~

~~ln of final acute intercept =~~

~~d. FAV equation =~~

C. Aquatic Maximum Value (AMV) calculation: $AMV = \frac{FAV}{2} = \frac{393{,}846\ \text{ug/l}}{2} = \boxed{196{,}923\ \text{ug/l.}}$

1,4-Dioxane (cont'd.):

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FINAL CHRONIC VALUE CALCULATIONS

A. Minimum 8 species requirement is **not** met (Tier II). Minimum requirements met = 0
Minimum requirements missing for Tier I = 8.

1. Acute to chronic ratio

a. Number ACRs meeting minimum data requirements = 0 (Table –)

b. Acute to chronic ratio = 18.

2. Toxicity **is not** dependent on a water characteristic

$$FCV = \frac{\text{Tier II FAV}}{\text{Tier II ACR}} = \frac{393{,}846\ \text{ug/l}}{18} = \boxed{24{,}880\ \text{ug/l}}$$

~~3. Toxicity **is** dependent on a water characteristic~~

~~a. Slope = (Table _)~~

~~b. Aquatic chronic intercept = (Table _)~~

~~ln of aquatic chronic intercept =~~

~~c. FCV equation =~~

~~B. Minimum 8 species requirement **is** met (Tier I)~~

~~1. Toxicity **is not** dependent on a water characteristic~~

~~a. FCV = ___ (Att. ___)~~

~~2. Toxicity **is** dependent on a water characteristic~~

~~a. Slope = (Table _)~~

~~b. Ranked genus mean chronic intercepts: Table ___~~

~~c. Final chronic intercept = ____ (Att. ___); ln of final chronic intercept =~~

~~d. FCV equation =~~

APPENDIX F

Calculation of Refined Avian TRVs

Appendix F
Calculation of Refined Avian TRVs
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Reference (a)	Test Organism	NOAEL (mg/kg bw/day)	LOAEL (mg/kg bw/day)
Reproduction			
Ankari et al. 1998	Chicken (Gallus domesticus)	4.05	12.1
Harms and Buresh 1986	Chicken (Gallus domesticus)	13.9	19.5
Jackson and Stevenson 1981a	Chicken (Gallus domesticus)	15.6	23.3
Stevenson et al. 1983	Chicken (Gallus domesticus)	16.7	34.0
Jackson and Stevenson 1981b	Chicken (Gallus domesticus)	17.0	25.5
Stevenson et al. 1983	Chicken (Gallus domesticus)	18.0	28.0
Jackson and Stevenson 1981a	Chicken (Gallus domesticus)	19.4	29.0
Jackson and Stevenson 1981b	Chicken (Gallus domesticus)	20.5	30.7
Griminger 1977	Chicken (Gallus domesticus)	22.4	44.8
Pearce et al. 1983	Chicken (Gallus domesticus)	22.5	45.0
Jackson et al. 1979	Chicken (Gallus domesticus)	23.2	29.9
Stevenson and Jackson 1980	Chicken (Gallus domesticus)	27.2	54.4
Chiou et al. 1997	Chicken (Gallus domesticus)	27.5	40.6
Jackson 1977	Chicken (Gallus domesticus)	29.1	47.5
Chiou et al. 1998	Chicken (Gallus domesticus)	33.4	40.1
Jackson and Stevenson 1981b	Chicken (Gallus domesticus)	40.0	50.0
Shivanandappa et al. 1983	Chicken (Gallus domesticus)	239	318
Growth			
Kashani et al. 1986	Turkey (Melagris gallopavo)	2.34	4.68
McGhee et al. 1965	Chicken (Gallus domesticus)	3.83	7.67
Waibel et al. 1964	Turkey (Melagris gallopavo)	5.82	46.6
Ekperigin and Vohra 1981	Chicken (Gallus domesticus)	8.59	42.9
Ekperigin and Vohra 1981	Chicken (Gallus domesticus)	8.59	42.9
Gill et al. 1995	Chicken (Gallus domesticus)	9.52	19.0
Foster 1999	Duck (Anas platyrhynchos)	10.2	51.6
Nam et al. 1984	Chicken (Gallus domesticus)	12.2	24.3
Chiou et al. 1999	Chicken (Gallus domesticus)	13.3	26.6
Poupoulis and Jensen 1976	Chicken (Gallus domesticus)	14.3	28.7
Poupoulis and Jensen 1976	Chicken (Gallus domesticus)	14.3	28.7
Poupoulis and Jensen 1976	Chicken (Gallus domesticus)	14.3	28.7
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Ringwood, New Jersey

Reference (a)	Test Organism	NOAEL (mg/kg bw/day)	LOAEL (mg/kg bw/day)
Funk and Baker 1991	Chicken (Gallus domesticus)	15.7	25.8
Miles et al. 1998	Chicken (Gallus domesticus)	16.5	24.7
Stevenson and Jackson 1980	Chicken (Gallus domesticus)	16.7	33.4
Miles et al. 1998	Chicken (Gallus domesticus)	17.2	25.8
Smith 1969	Chicken (Gallus domesticus)	17.8	31.1
Wang et al.1987	Chicken (Gallus domesticus)	17.8	35.5
Stevenson et al. 1983	Chicken (Gallus domesticus)	18.0	28.0
Jensen and Maurice 1978	Chicken (Gallus domesticus)	18.5	37.1
Funk and Baker 1991	Chicken (Gallus domesticus)	19.6	30.5
Jackson and Stevenson 1981b	Chicken (Gallus domesticus)	20.5	30.7
Robbins and Baker 1980	Chicken (Gallus domesticus)	21.3	42.7
Ekperigin and Vohra 1981	Chicken (Gallus domesticus)	21.5	42.9
Miles et al. 1998	Chicken (Gallus domesticus)	21.9	34.0
Griminger 1977	Chicken (Gallus domesticus)	22.4	44.8
Kassim and Suwanpradit 1996	Chicken (Gallus domesticus)	22.7	34.1
Jackson and Stevenson 1981a	Chicken (Gallus domesticus)	23.0	30.7
Jackson et al. 1979	Chicken (Gallus domesticus)	23.2	29.9
Jackson and Stevenson 1981b	Chicken (Gallus domesticus)	23.3	31.0
Jackson and Stevenson 1981a	Chicken (Gallus domesticus)	26.4	35.2
Ledoux et al. 1989	Chicken (Gallus domesticus)	26.9	40.4
Chiou et al. 1997	Chicken (Gallus domesticus)	27.9	35.3
Poupoulis and Jensen 1976	Chicken (Gallus domesticus)	28.7	57.4
Vohra and Kratzer 1968	Turkey (Melagris gallopavo)	29.7	59.3
Mehring and Brumbaugh 1960	Chicken (Gallus domesticus)	33.0	43.3
Harms and Buresh 1986	Turkey (Melagris gallopavo)	34.6	51.9
Funk and Baker 1991	Chicken (Gallus domesticus)	35.2	63.9
Kassim and Suwanpradit 1996	Chicken (Gallus domesticus)	49.5	74.2
Jackson 1977	Chicken (Gallus domesticus)	50.9	55.9
Foster 1999	Duck (Anas platyrhynchos)	56.8	109
Vohra and Kratzer 1968	Turkey (Melagris gallopavo)	60.0	120
Geometric Mean of NOAEL and LOAEL		19.6	36

Reference (a)	Test Organism	NOAEL (mg/kg bw/day)	LOAEL (mg/kg bw/day)

Notes:

a. All growth and reproduction studies presented in USEPA 2007 with both NOAEL and LOAEL value reported.

LOAEL = Lowest observed adverse effects level

mg/kg bw/day = Milligrams per kilogram body weight per day

NOAEL = No observed adverse effects level

USEPA = United States Environmental Protection Agency

USEPA. 2007. Ecological Soil Screening Levels for Copper: Interim Final. USEPA, Washington, D.C. OSWER Directive 9285.7-68. February.

Appendix F
Calculation of Refined Avian TRVs
Site-Related Groundwater Ecological Assessment
Ringwood Mines/Landfill Superfund Site
Ringwood, New Jersey

Reference (a)	Test Organism	NOAEL (mg/kg bw/day)	LOAEL (mg/kg bw/day)
Reproduction			
Edens and Garlich 1983	Japanese quail (Coturnix japonica)	0.194	1.94
Edens and Garlich 1983	Chicken (Gallus domesticus)	1.63	3.26
Meluzzi et al. 1996	Chicken (Gallus domesticus)	2.69	4.04
Morgan et al. 1975	Japanese quail (Coturnix japonica)	12.6	126
Morgan et al. 1975	Japanese quail (Coturnix japonica)	67.4	135
Growth			
Edens and Garlich 1983	Japanese quail (Coturnix japonica)	1.56	15.6
Edens and Melvin 1989	Japanese quail (Coturnix japonica)	5.93	59.3
Damron et al. 1969	Chicken (Gallus domesticus)	6.14	61.4
Damron et al. 1969	Chicken (Gallus domesticus)	7.10	71.0
Edens et al. 1976	Japanese quail (Coturnix japonica)	11.1	111
Edens 1985	Japanese quail (Coturnix japonica)	11.2	112
Morgan et al. 1975	Japanese quail (Coturnix japonica)	12.6	126
Morgan et al. 1975	Japanese quail (Coturnix japonica)	13.5	67.4
Hoffman et al. 1985	American kestrel (Falco sparverius)	25.0	125
Berg et al. 1980	Chicken (Gallus domesticus)	61.3	123
Geometric Mean of NOAEL and LOAEL		7.3	43

Notes:
a. All growth and reproduction studies presented in USEPA 2005 with both NOAEL and LOAEL value reported.
LOAEL = Lowest observed adverse effects level
mg/kg bw/day = Milligrams per kilogram body weight per day
NOAEL = No observed adverse effects level
USEPA = United States Environmental Protection Agency
USEPA. 2005. Ecological Soil Screening Levels for Lead: Interim Final. USEPA, Washington, D.C. OSWER Directive 9285.7-70. March.

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